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A SYSTEM OF GYNECOLOGY
AND OBSTETRICS
BY AMERICAN AUTHORS.

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SOME COMPLICATIONS OF THE PUERPERAL STATE INDEPENDENT OF SEPTIC INFECTION.

BY BARTON COOKE HIRST, M. D.,

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ABNORMALITIES IN THE INVOLUTION OF THE UTERUS AFTER CHILDBIRTH.

AN abnormal course in the return of the uterus from the post-partum condition to the ordinary dimensions and weight of a non-gravid womb may manifest itself by excess or defect: there may be superinvolution or subinvolution; and these abnormal degrees of a natural process may be seen in cervix and body, in peritoneal, vascular, muscular, mucous, and connective tissues.

SUPERINVOLUTION.—This condition is the result of an abnormal prolongation, or an exaggeration of that process by which the gravid womb returns, after delivery, to the dimensions of a healthy uterus in a woman not pregnant, in consequence of which this organ is left, some time after labor, smaller than in its virgin state. Sir James Y. Simpson first directed attention to morbid deficiency and morbid excess in the involution of the uterus after labor: since his time many writers have called attention to deficient involution; a smaller number have described the rarer anomaly of the two—excessive involution. Trommel detected superinvolution in 29 of 3000 cases; Simpson¹ saw it in 22 out of 1300 cases; Sinclair,² in measuring 108 uteri after childbirth, found in 22 instances a uterine cavity of less than $2\frac{1}{4}$ inches; and Fordyce Barker³ has declared that he sees from one to three cases every year, and that in his opinion this abnormal condition constitutes about 1 per cent. of uterine diseases. Hansen⁴ among 120 nursing women found 2 with a ute-

¹ A. R. Simpson: "Superinvolution of the Uterus," *Tr. Edinburgh Obstet. Soc.*, 1882-83, viii. p. 88.

² *Tr. Am. Gyn. Soc.*, vol. iv. This series of measurements, as well as others made later by Sinclair and Richardson (*Tr. Am. Gyn. Soc.*, vols. vi. and vii.), are sharply criticised by Hansen, who declares them to be in great part incorrect: the criticism is apparently merited.

³ *Tr. Am. Gyn. Soc.*, viii., 1883, discussion on Dr. Johnson's paper.

⁴ "Ueber die puerperale Verkleinerung des Uterus," *Ztschr. f. Geburtsh. u. Gyn.*, xiii. S. 16.

rine cavity below 6 cm. (5.6, 5.4 respectively) at the eighth and tenth week after delivery. Johnson¹ gives an account of three cases which occurred in his practice, and Simpson² refers to those described by Chiari, Chiarleoni, Jaquet, and Whitehead. An interesting case after abortion has recently been reported by Dr. C. M. Hansen³ of Minnesota.

The etiology of the condition is somewhat obscure. It might be ascribed, as Simpson says, to wasting diseases, as phthisis, cancer, etc.; to anæmia from hemorrhage at a previous birth or miscarriage; to nervous derangements, as puerperal insanity or chorea; to over-lactation; to a rapid succession of labors; to local inflammations, especially those which attack the ovaries and abrogate their functions. The degree to which the superinvolution may occasionally progress is surprising: A. R. Simpson reports a case in which the uterine cavity measured but a quarter of an inch, and Whitehead⁴ saw a still greater reduction in the size of the uterus and its appendages after labor.⁵

SUBINVOLUTION.—Subinvolution may be described as an arrested or a retarded involution of the puerperal uterus. With such a definition it is requisite to clearly comprehend the normal process of involution before attempting to understand the conditions that may interfere with its natural progression. Unfortunately, however, this is still one of the unsolved problems of obstetrics as regards, at least, the reduction of the chief constituent part of the uterine body, the muscular tissue. Three theories may be advanced to account for it: (1) A fatty degeneration of the muscle-fibres and the absorption of the fine granular fat-globules to the complete destruction of the uterine muscle, its place being taken by a new growth of muscle-fibres developed from the embryonal muscle-cells in the outer layers of the uterine musculature. (2) An atrophy of the large muscle-fibres seen in a pregnant uterus at term. (3) The conversion of the muscle-cell contents into a peptone, its absorption into the blood-current and discharge through the kidneys, giving rise to the peptonuria of puerperal women (Fischel).

Kilian,⁶ in his examination of rabbits' uteri thirty to thirty-six hours after they had expelled their young, found fat-globules in the epithelial covering of the uterus, noticed that the muscle-fibres looked fainter and paler than in pregnancy, and saw in their interior very fine shining fat-globules: alongside of these degenerated muscle-fibres Kilian found some quite young fibres, as he had seen them in the uteri of young

¹ "Superinvolution of the Uterus," *Tr. Am. Gyn. Soc.*, viii., 1883.

² *Loc. cit.*

³ *Medical Record*, Oct. 6, 1888.

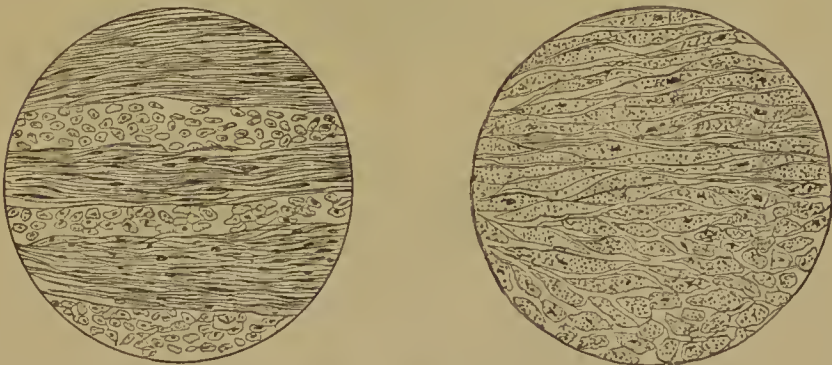
⁴ *Br. Med. Journ.*, October, 1872.

⁵ For a description of the treatment and diagnosis of this condition see Vol. I. SYSTEM OF GYNECOLOGY.

⁶ "Die Structur des Uterus bei Thieren," *Heute u. Pfeuffer's Ztschr. f. rationelle Medicin*, 1849 u. 1850, Bd. viii. u. ix.

animals. Heschl¹ confirmed Kilian's observations, and went even farther in declaring that the muscle-cells were completely destroyed by fatty degeneration; this writer saw in the outer portion of the uterine body first nuclei; these, then developing cell-contents around them, gradually transformed themselves into typical unstriated muscle-fibres. Thus after labor the uterine muscle was destroyed and a new development of muscle-tissue occurred to take its place. Robin,² on the other hand, claimed that the involution of the uterine muscle is essentially atrophy of the individual muscle-cells. Kölliker³ says that the involution of the puerperal uterus consists in a diminution in size of the contractile fibres in the muscle-layer, alongside of which may be seen fatty degeneration. Mayor,⁴ from a study of 14 specimens dating from the first day after delivery till the ninth month of lactation, concludes that while the fatty degeneration of the muscle-fibres is more pronounced than Robin thought, it is far from having the importance that Heschl attributed to it: it does not seem, as this author believes, to cause the destruction of the muscular elements. Mayor, therefore, attributes to atrophy the predominant rôle in the involution of the uterus. Winckel⁵ still holds that the reduction of the puerperal uterus

FIG. 108.



Muscular Tissue of the Pregnant and of the Puerperal Uterus.

is due to fatty degeneration. Säger,⁶ from the observation of 12 uteri obtained at periods varying from four hours to fifty-five days after labor, recognizes the fatty degeneration in the muscle-cells, but does not believe that they are destroyed.⁷ Microscopic sections of 5 uteri in

¹ "Untersuchungen über das Verhalten des menschlichen Uterus nach der Geburt," *Ztschr. der k. k. Gesellschaft der Aerzte in Wien*, 1852, viii. 2.

² *Dict. encycl. des Sc. méd.*, 2e serie, t. x. p. 14. ³ *Gewebelehre*, 5te Auflage, p. 565.

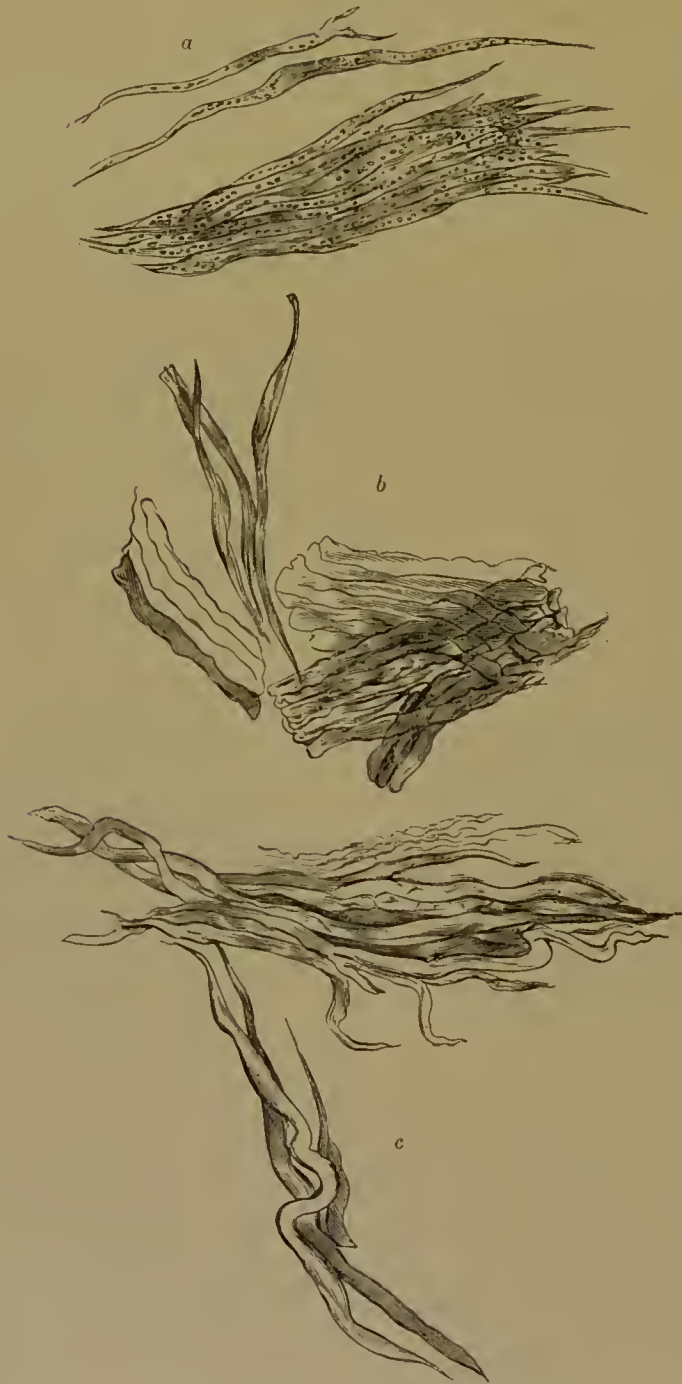
⁴ "Étude histologique sur l'involution utérine," *Arch. de Physiol. norm. et path.*, ix., x., 1887, p. 560.

⁵ *Lehrbuch der Geburtshilfe*, 1889.

⁶ Abstr. in *Schmidt's Jahrbücher*, No. 3, 1888, p. 250.

⁷ Säger says that "the fat-globules and other degeneration-products do not enter, as such, into the circulation, but are oxidized on the spot. There is no such thing as a puerperal lipæmia" (*Die Rückbildung der Muscularis des puerperalen Uterus*).

FIG. 109.



a, Uterine Muscle-fibres nine days post-partum; *b*, Uterine Muscle-fibres eight days post-partum; *c*, Uterine Muscle-fibres in the eighth month of pregnancy.

my possession, obtained respectively in the last week of pregnancy, two hours, thirty-six hours, seventy-two hours, and seven days after con-

finement, would certainly seem to indicate that fatty degeneration plays a most important part in the reduction of the large muscle-cells characteristic of pregnancy to the much smaller muscular fibres of the unimpregnated womb. My own belief is that the redundant material within each cell is destroyed by some degenerative process (chiefly fatty), but that the cell is not destroyed *in toto*. Recent measurements made by Sanger¹ show very plainly that the reduction of the uterus after labor is effected by a diminution in the size of the individual fibres, and not by their destruction.² There is a greater unanimity of opinion in regard to the involution of the serous covering, connective tissue, blood-vessels, and mucous membrane of the puerperal uterus.

Mayor³ found in the peritoneal covering of the uterus after delivery a number of folds in the membrane: at the bottom of these folds the endothelial cells seemed to be transformed into a spheroidal shape. Kilian⁴ found the cells in this region infiltrated with fat-globules. Bernstein,⁵ in a study of involution in the rabbit's uterus, paid especial attention to the behavior of the connective tissue: he found that the reduction of this tissue in the puerperal uterus was effected by a fatty degeneration of the connective-tissue cells, and by a drying out, as it were, of the connective-tissue fibres; these, deprived of the excessive blood-supply of pregnancy, dry up and shrink. Bernstein incidentally mentions the fatty degeneration of the peritoneal endothelium, and expresses the opinion that the muscle-cells, while they do undergo a fatty degeneration, are not completely destroyed.

The chief changes in the blood-vessels seem to be shrinkage, the obliteration of many large vessels by a connective-tissue growth in the intima, associated with fatty degeneration of the media,⁶ and the development of new elastic fibres in the adventitia of the vessels not obliterated (Mayor).

The involution of the endometrium is now, thanks to the investigations, first of Friedlander,⁷ then of Kundrat,⁸ Engelmann,⁹ Langhans,¹⁰ Leopold,¹¹ and others, clearly understood. When the ovum is cast off

¹ *Loc. cit.*

² Fibre-length in pregnant uterus	208.7 μ
“ “ in first few hours p.-p.	158.3 μ
“ “ until the 4th day of the puerperium	117.4 μ
“ “ in first half of 2d week p.-p.	82.7 μ
“ “ in beginning of 3d week	32.7 μ
“ “ at end of 5th week	24.4 μ

³ *Loc. cit.*

⁴ *Loc. cit.*

⁵ *Ein Beitrag zur Lehre von der puerperalen Involution des Uterus*, D. i., Dorpat, 1885.

⁶ Balin: “Ueber das Verhalten der Blutgefae im Uterus nach stattgehabter Geburt,” *Arch. f. Gynak.*, Bd. xv.

⁷ *Physiol.-Anatom. Untersuch. uber den Uterus*, Leip., 1870, *Arch. f. Gyn.*, Bd. ix.

⁸ *Wien. med. Jahrbucher*, 1873.

⁹ *Ibid.*

¹⁰ *Arch. f. Gynak.*, Bd. viii.

¹¹ *Ibid.*, Bd. xii.

at term, it carries with it, in the strictly normal case, the whole ovular or epichorial decidua and the upper cellular layer of the uterine decidua, leaving behind on the uterine wall the lower cellular layer and the

FIG. 110.

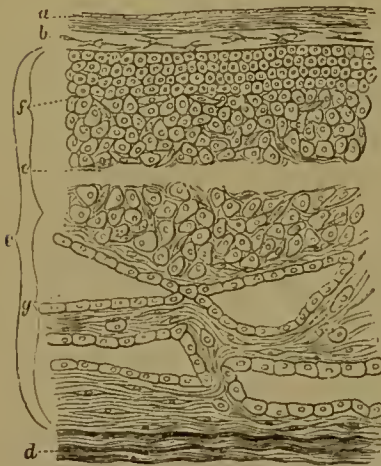


FIG. 110.—Diagrammatic Representation of Decidua (Friedländer): *a*, amnion; *b*, chorion; *c*, decidua; *u*, uterine muscle; *e*, line of separation in the cellular layer; *f*, cellular layer; *g*, glandular layer.

FIG. 111.

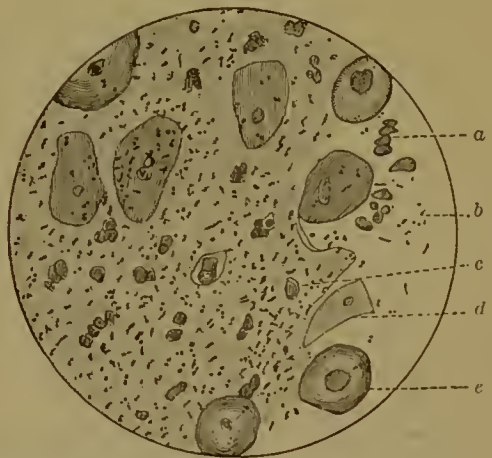


FIG. 111.—Lochia on Seventh Day: afebrile case: *a*, blood-corpuscles; *b*, diplo- and monococci; *c*, white blood-corpuscles; *d*, epithelium; *e*, decidual cells.

glandular portion of the uterine mucous membrane. This membrane, deprived in great part of its nutriment by the contraction of the uterine

FIG. 112.

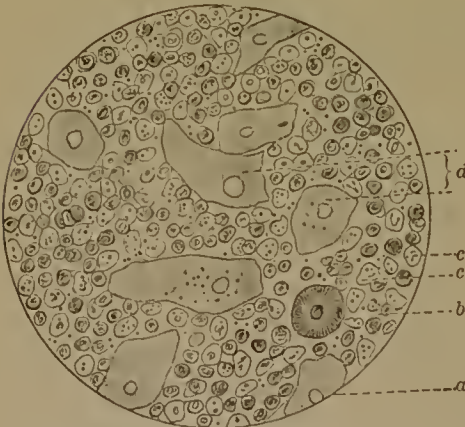


FIG. 112.—Lochia on the Second Day (lochia cruenta), showing a few cocci and streptococci (Winckel): *a*, decidual cells; *b*, red blood-corpuscles; *c*, white blood-corpuscles; *d*, epithelium.

FIG. 113.

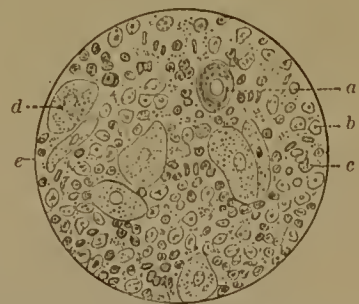


FIG. 113.—Lochia on the Fourth Day: *a*, decidual cells; *b*, white blood-corpuscles; *c*, a few red blood-corpuscles; *d*, epithelium; *e*, micro-organisms (Winckel).

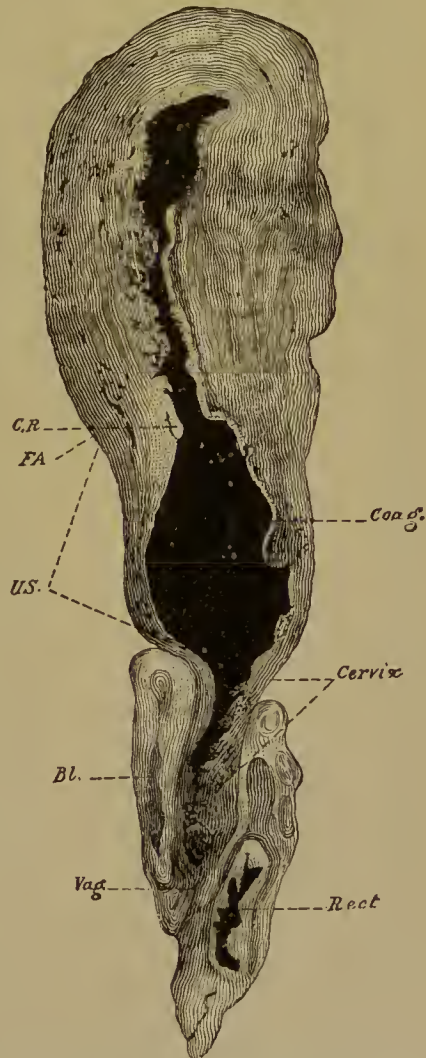
wall and the obliteration of many of its blood-vessels, loses its vitality in that portion farthest removed from its source of nutriment—the

superficial layer of decidual cells. These die and are cast off with the lochial discharge in a condition of fatty degeneration or disintegration. By the shedding of these cells in time the glandular layer of the decidua is laid bare. Now the involution proper of the endometrium ceases and a regeneration of the membrane begins. The epithelial cells within the glands take on an active growth and reproduction; the interglandular connective tissue shares in this new development: by its growth it rises in embankments between the glands, making them deeper, and so in time reproducing the characteristic utricular glands of the uterine mucous membrane. This process requires some time. Mayor says: "On the twenty-fourth day after delivery I have not found glands in the region of the placental insertion. The mucous membrane, although reconstructed at the second month, is then furnished with fewer glands, less regularly disposed and of a greater calibre, than in the normal state."

The uterus is not the only organ of the sexual system that experiences a retrograde change after labor. The ovaries and tubes, the broad and round ligaments, the pelvic connective tissue, blood-vessels and lymphatics, all undergo modification. That portion also of the birth-canal—the lower uterine segment, the cervix, the vagina, and the vulva—which is dilated to an extreme degree to allow the passage of the fetal body, must likewise be subjected to rapid involution to regain its wonted tone and calibre. In these structures the process is mainly one of retraction

of overstretched tissue; but there is in addition a certain amount of degeneration and atrophy of the redundant cells that the increased blood-supply and increased stimulus to growth of pregnancy called into existence. Particularly is this true of the lower uterine segment and cervix, which in their involution must display an intermediate

FIG. 114.



A Frozen Section of a Puerperal Uterus in the first twenty-four hours (Benckisser and Hofmeier).

process between that by which the reduction of the uterine body is effected and that by which the lower portion of the parturient tract regains its normal state.

The involution of the uterine adnexa will progress satisfactorily if the uterine involution itself is normal. The reduction of the over-stretched vagina and vulva is sure to occur if these parts have not been seriously lacerated, although, like all overstretched muscular canals, they never quite return to their original calibre. The clinical study, therefore, of arrested or retarded involution of the genitalia in the puerperal state may be confined to the uterus.

Causes of Subinvolution.—There is still some difference of opinion in regard to the exact nature of the changes which occur in the individual muscle-cells during involution of the uterus: there can be no doubt as to the cause of these changes, whatever they may be. It is a great reduction of their blood-supply. In a general way, therefore, it may be asserted that any condition which tends to prevent a rapid diminution of the blood-supply to the puerperal uterus can become a cause of subinvolution. Nature's only method of decreasing the quantity of blood in the puerperal uterus is by the agency of the contracting muscle-fibres; therefore it may again be asserted that any condition which interferes with the contraction of the uterus will become a cause of subinvolution. It is necessary, in my opinion, to make these two broad divisions in the etiology of subinvolution, for, although frequently interdependent, they are not rarely, I believe, independent of one another. In point of frequency I would place first those causes which interfere with the decrease of the blood-supply to the uterus by attracting more blood to the organ after labor than is required during the normal process of involution. Prominent among these should stand hyperplasia of the endometrium. Possibly my own experience is exceptional in this particular, for in the two hospitals which are for a part of the year under my care the patients are either illegitimately pregnant, and have been engaged in efforts to conceal or to terminate their condition, or are recruited from the lower working-classes, and have had to endure privation and hard labor often during the whole of pregnancy. Certain it is that among such women subinvolution is very common, and is due, in my experience at least, most frequently to the retention of hypertrophied decidua within the uterus after labor. The first case of the kind which I saw, some years ago, was a primipara, illegitimately pregnant, who had endeavored to conceal her condition by tight lacing: fourteen days after labor the fundus stood not far below the umbilicus; the uterine cavity was scraped out with a enrette, and quite two handfuls of pulstaceous deciduous membrane removed; within twenty-four hours the uterus had almost regained the

size commonly seen two weeks after delivery. This experience has since been multiplied many times.

Subinvolution by an excess of blood-supply may occasionally be traced to the presence throughout the uterine wall of small fibroids. Recently two such cases have come under my notice: in one at the twelfth, in the other at the fourteenth day, the fundus still stood at the umbilicus; in neither of these cases were the fibroids large enough to have interfered with contraction, but in both instances exerted their influence upon involution by attracting too much blood to the uterus. An explanation of subinvolution by hyperæmia might be presented thus: The involution of the uterine muscle is due to the decrease of its blood-supply; the quantity of blood in the puerperal uterus is continuously diminished by the progressive contraction of the uterine muscle-fibres; when muscle-cells contract they burn up a portion of themselves in the effort put forth; the effete products of tissue-combustion are discharged into the venous system, while new material to replace what has been lost is absorbed from arterial blood. Physiologists say that during the contraction of a muscle all the blood-vessels within it are dilated, thus affording the greatest facility for the discharge from the muscle-cells of waste material and the absorption of new matter. In the uterus this arrangement does not obtain: the contraction of the uterine muscle necessarily diminishes very much the calibre of the blood-vessels, depriving thus the muscle-cells of the increased blood-supply which they require during action. Yielding, therefore, a vital portion of themselves to furnish the contractile force, surrounded by the products of their partial destruction, which are not carried off by the venous current, unable to resupply their lost constituents by absorption from arterial blood, the muscle-cells must undergo some degenerative process. But should there be some condition about the uterus which draws to it an abnormally great supply of blood, the muscle-cells can contract without such great detriment to themselves; their degeneration proceeds more slowly, is accomplished more imperfectly, than under ordinary circumstances. Other causes, besides the two already given, leading to this result, are lacerations of the cervix and periuterine inflammations, or inflammations of the uterine body and lining membrane, usually the result of sepsis; retention within the uterus of small fragments of placenta, shreds of membranes, placental or fibrinous polyps; chronic constipation, producing, as it will, pelvic congestion; and anything which interferes with the return of the venous blood to the heart, as increased intra-abdominal pressure, certain diseases of the liver, and valvular disease of the heart itself. From this last-named cause I have recently seen a most marked case of subinvolution. On the eleventh day the fundus stood halfway between symphysis and umbilicus; on the eigh-

teenth day it still rested more than two fingers' breadth above the symphysis pubis.

Many conditions might be found to constitute that other cause of subinvolution—prevention of uterine contraction. Large intramural and submucous fibroids will do it; unusually large masses of hypertrophied decidua that sometimes develop at the placental site; the retention within the uterus of considerable portions of the placenta or of placenta succenturiata; large blood-clots; the displacement of the uterus by a retroversion or flexion of the organ or by an overfilled bladder; peritoneal adhesions from old or recent inflammatory attacks involving the serous covering of the uterus and adjacent parts,—all may prevent effective uterine contraction after labor. One fact must stand out clearly from an experience in such cases: the cause of subinvolution is some local trouble and not a constitutional derangement. It must be every obstetrician's experience—it is certainly my own—to see the puerperal state complicated by many acute or chronic febrile affections, which do not, however, influence in the slightest degree uterine involution: thus I have seen typhoid fever, pneumonia, phthisis, eclampsia, general septicæmia where the point of entrance for the infecting poison was the rectum, and the uterus was not involved, and malaria in the puerperal state; and yet involution has gone on in a normal manner despite these constitutional complications and the fever that accompanied them.¹ One exception, however, must be made to this general statement: nervous derangements do influence involution. A. R. Simpson assigns to puerperal insanity quite a prominent rôle in the causation of superinvolution. On the other hand, a sudden mental shock, some powerful emotion, may arrest involution. One of my patients recently had quite a profuse puerperal hemorrhage on the seventh day, due, I think, to sudden uterine relaxation in consequence of the fright she experienced on hearing a stepson return to the house late at night in a violent state of intoxication.

DIAGNOSIS.—This is easy when one is familiar with the normal progress of involution. According to Depaul, the fundus uteri should be a finger's breadth above the umbilicus on the first day of the puerperal state, higher than it is directly after birth; on the second day, at the level of the umbilicus; the third day, a little below; the fourth day, about the same; the fifth and sixth days, two fingers' breadth below; the seventh, eighth, and ninth days, three or four fingers' breadth above the symphysis pubis; the tenth, eleventh, and twelfth days, at the level of or a little below the pubes.² Hausen, after very

¹ Temesváry and Bäcker ("Studien aus dem Gebiet des Wochenbettes," *Archiv für Gynäk.*, Bd. xxxiii. H. 3, S. 331, 1888) actually make the assertion that fever favors the involution of the uterus.

² Parvin's *Obstetrics*, p. 532. For a more extensive bibliography of uterine measure-

careful measurements of 120 nursing women from the tenth day till the third month after delivery, gives the following as the normal course of involution from the tenth day of the puerperium until the process is completed :

		Average Intra-uterine Measurement.	Minimum.	Maximum.
10th day	(114 measurements)	10.6 cm.	8.0 cm.	13.5 cm.
15th "	(119 ")	9.9 "	8.3 "	11.5 "
3d week	(95 ")	8.8 "	7.5 "	10.5 "
4th "	(80 ")	8.0 "	7.0 "	9.3 "
5th "	(64 ")	7.5 "	6.5 "	9.0 "
6th "	(56 ")	7.1 "	6.2 "	9.1 "
7th "	(40 ")	6.9 "	6.0 "	8.5 "
8th "	(31 ")	6.7 "	5.6 "	8.5 "
10th "	(22 ")	6.5 "	5.4 "	7.5 "
12th "	(15 ")	6.5 "	6.0 "	7.5 "

In two-thirds of the cases Hansen found involution completed in six to ten weeks; in one-sixth, not until the last half of the third month or later; in again a sixth, within six weeks; the most rapid involution occupied four weeks. Any great deviation from this normal course may easily be detected either by abdominal palpation or by the use of a sound, while along with the arrest or retardation of involution will usually be found an excessive lochial discharge. Ahlfeld¹ claims that free perspiration after labor is a valuable sign of firm uterine contraction in the early part of the puerperal state: when it fails to appear he always looks for uterine relaxation.

TREATMENT.—Here, as elsewhere in medicine, the treatment should be directed not so much toward the symptom (subinvolution) as toward its cause. It is evident, therefore, that the treatment of this condition must vary greatly in individual cases. If the subinvolution depends upon the retention of hypertrophied decidua, a curette will promote rapid involution more effectively than anything else. If placenta or membranes are retained in uteri, they should be removed. Where involution has been retarded by fibroids, the administration of ergot, strychnia, and quinine in pill form and the application of a faradic current have yielded good results. The bladder should never be allowed to remain distended with urine nor the rectum with feces. Inflammation in or about the uterus must be combated by appropriate treatment. If the heart-valves are imperfect and the abdominal and pelvic veins consequently engorged with blood, a heart tonic, as digitalis or strophanthus, will often assist involution. Charpentier has asserted that the routine administration of ergot in the puerperal state will hasten

ments in the puerperal state see *Schroeder's Lehrbuch*, 8th ed., 1884, p. 230, and Hansen, *loc. cit.*

¹"Die Zusammenhang zwischen Schweisseruption post-partum und Uterus-contractionen," *Ber. u. Arbeit. a. d. Geburts. Gynäk. Klinik zu Marburg*, 1885-86, Bd. iii, p. 81.

involution. This would seem reasonable, but clinical experience has not borne out the statement.

Herman and Fowler¹ did find, in experimenting on two sets of patients—one, 58 in number, which got an ergot mixture daily for a fortnight after labor, the other, 68 in number, which got a single dose of ergot after labor—that in the first set involution advanced more rapidly, but there was no difference in the lochial discharge. Dr. Boxall² also declared himself in favor of the routine practice of giving ergot during the puerperium, asserting that in two series of cases, comprising each a hundred—one treated without, the other with ergot—there were fewer blood-clots, these were more quickly discharged, and the after-pains were less in frequency, duration, and intensity in the latter series. Dr. Dakin,³ however, dissented from these views, and claimed, likewise after testing the matter in practice, that the routine administration of ergot retarded involution by at least twenty-four hours. Blane⁴ also declares that the administration of ergotin during the first five or ten days of the puerperal state has not a favorable influence upon involution, but seems to interfere with it to some extent. As it is doubtful, therefore, whether ergot does aid involution, as there are many obvious disadvantages connected with its routine administration in the puerperal state, the adoption of this practice would be unwise.

PUERPERAL ANÆMIA.—This condition is placed after subinvolution of the uterus because it can, not inaptly, be called a subinvolution of the blood. After the first twenty-four hours of the puerperal state there begins a change in the constitution of the blood by which it is converted from the hydræmia of pregnancy to the normal proportion of its constituent parts in the non-gravid woman. At the end of two weeks this process is so far complete that the blood is more nearly in a normal condition than it was during pregnancy.⁵ Many causes, however, may disturb the progress of this recovery from the hydræmia of pregnancy. Illness of any kind during pregnancy, hemorrhage during labor,⁶ nervous affections, as insanity or chorea, during the puerperal state, kidney disease, fevers, etc., may all induce puerperal anæmia. The treatment of the condition must be governed by the circumstances of the individual case. The cause of the anæmia being removed, the

¹ "On the Effect of Ergot on the Involution of the Uterus," *Br. Med. Journ.*, 1888, i. 299.

² *Ibid.*

³ *Ibid.*

⁴ *Ann. de Gynéc.*, March, 1888.

⁵ Meyer: "Untersuchungen über die Veränderung des Blutes in der Schwangerschaft," *Arch. f. Gynäk.*, Bd. xxxi. S. 145.

⁶ It is extraordinary, however, to see how rapid occasionally is the recovery of puerperæ even from severest hemorrhage. A loss of 2000–2500 grammes of blood is usually fatal to an adult, but Ahlfeld reports two cases in which, respectively, 2000 and 2500 gr. of blood were lost without being followed by serious anæmia (*Ber. u. Arb. a. d. Geb. Gyn. Klinik zu Marburg*).

blood will improve, and the improvement may be accelerated by tonic drugs and good diet. After hemorrhages beef tea, animal soups, and as nutritious a diet as the patient can bear, along with tonic medicines, will hasten recovery. Under the prolonged use of Bland's pill I have seen the blood-corpuscles rise from less than three to nearly four and a half million per c. mm., and the hæmoglobin increase from 40 to 75 per cent. in a few weeks. In some cases arsenic alone succeeds where iron fails. Dr. Osler¹ has recently reported an interesting case of the kind.

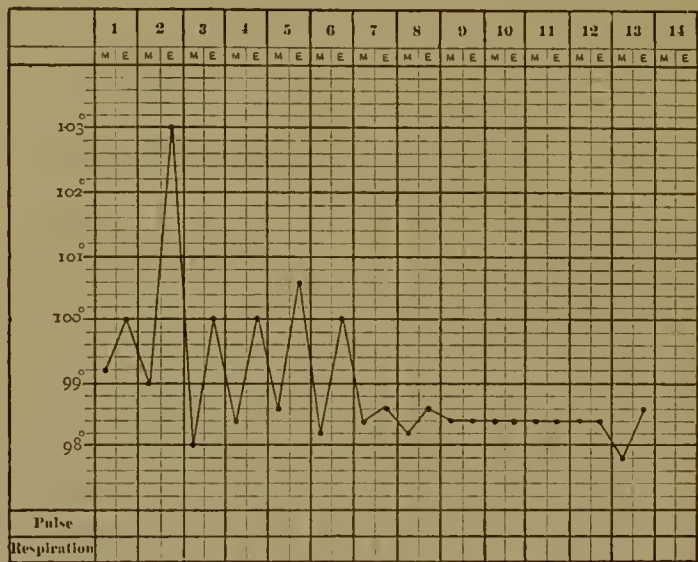
REPAIR OF THE INJURIES OF CHILDBIRTH.

Hand in hand with the progress of involution in the female genitalia after childbirth goes the reparation of injuries which every woman experiences in some degree during that process. Slight cracks in the mucous membrane, small rents in cervix, vaginal wall, and vaginal outlet, either unite firmly or else are healed by granulation. This is to be expected. It is surprising, however, to find occasionally very extensive injuries repaired by natural processes. Perforations of the vaginal vault, fistulous openings into bladder and rectum, deep tears and perforations of the perineum, transverse rents and perforations of the labia, lacerations about the urethra,—all have been known to unite without interference. Winckel says that perineal tears when left to themselves will be found healed in two and a half to five weeks. Extensive injuries, however, should be repaired, as well as may be, by sutures. Vaginal and cervical tears do not always require this treatment, unless there is profuse hemorrhage. In lacerations of the perineum it should never be neglected. If the stitches are inserted carefully primary union will be secured in 75 per cent. of the cases. Careless suturing leads to disagreeable consequences: in complete tears of the perineum I have seen recto-vaginal fistulæ left behind, and in incomplete tears perineo-vaginal fistulæ result from an imperfect union of the wound. In fistulæ the result of sloughs after labor, if the opening be not too large, a cure can occasionally be effected by touching the edges of the fistula with a strong caustic, like nitric acid. To do this the diagnosis must be made in the lying-in period. This, as a rule, is not difficult. The escape of feces and gas from the vagina and a constant trickling of urine point respectively to a recto-vaginal or a genito-urinary fistula. It is necessary in the latter case to exclude the incontinence of urine and the overflow of retention sometimes seen in the puerperal state. All doubt is cleared away by finding the anomalous opening between bladder or ureter and vagina or cervical canal. In case of septic fever in the puerperal state it is well to examine the abrasions and wounds along the parturient tract, and, if they have taken

¹ *Boston Med. and Surg. Journ.*, 1888, p. 454.

on an unhealthy appearance, especially if covered with a diphtheritic membrane, to cauterize them, preferably, I think, with nitric acid or acid nitrate of mercury.

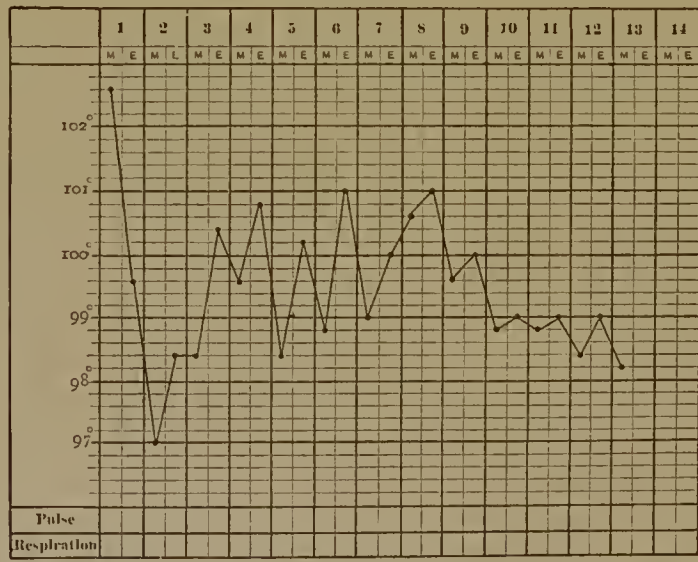
FIG. 115.



Bilateral Laceration of the Cervix with Subinvolution (Maternity Hospital).

Edema of the external genitals, the result of injuries, pressure, or contusions during labor, gives rise to considerable pain and discomfort,

FIG. 116.



Deep Laceration of Anterior Vaginal Wall with Tarnier's Forceps (Blockley).

which are best relieved by the application of cloths wrung out in a hot antiseptic solution. The influence of injuries in the genital tract upon

the course of the puerperal state is unfavorable. The danger of septic infection is materially increased, and fever is consequently more common, not only from this cause, but as a direct result of injury and irritation of tissue. In Fig. 115 I think this is well illustrated, although it is impossible to exclude absolutely septic infection from absorption. It must, however, be every obstetrician's lot to see cases guarded by strict antiseptic precaution which nevertheless have fever, to be explained by nothing else than the injury done the tissues during childbirth, and by the peculiar liability to abnormalities of temperature which is one of the essential features of the puerperal state. Fig. 116 is a good illustration of traumatic fever after childbirth. The subsequent elevation of temperature may have been septic, but this certainly cannot explain the rather high fever very shortly after labor.

Another consequence of injury to the vagina during labor is, according to Winckel, retention of urine. This author¹ says that he has seen obstinate cases of retention lasting from ten to fourteen days due to this cause.

PUERPERAL HEMORRHAGE.

The term "puerperal hemorrhage" is used to denote excessive bleeding from any point along the genital tract of the female occurring after the first day of the puerperium until involution of the uterus is completed—a period of about six weeks.

The causes of this accident are numerous, and should be well considered, for the treatment will be governed in most cases by a knowledge of the cause. An attempt will be made to place them as well as may be in the order of their frequency.

RETAINED PLACENTA AND MEMBRANES.

The retention within the uterus of the placenta, as a whole or in part, will very likely give rise to hemorrhage during the puerperal state. The retention of the whole placenta is not now a cause of puerperal hemorrhage, for no practitioner of the present day would allow this large mass to remain within the uterus many hours after delivery. Toward the end of the last century and in the beginning of this, however, it was not rare to find followers of William Hunter who trusted altogether to nature to deliver the placenta, often with most disastrous results. White² gives an account of four cases of retained placenta with fatal hemorrhage occurring on the first, second, third, and fourth days, respectively.

The retention of placental fragments is by no means a rare occur-

¹ *Lehrbuch der Geburtshilfe*, p. 741.

² *A Treatise on the Management of Pregnant or Lying-in Women*, Worcester, Mass., 1793, p. 215.

rence even now: a careful inspection of the placenta after delivery often shows a defect, and the missing piece will then be sought for and removed; but occasionally it is difficult or impossible to tell whether the placenta has come away entire; and if the retained portion is an accessory growth, there is, of course, nothing to indicate its existence. That the retention of placental fragments is not uncommon is shown most plainly by autopsies on puerperæ: Stadtfeld relates that in 70 such examinations there were found placental fragments in 7 cases, varying from the size of a hazelnut to that of an egg. Clinical observation would make this complication of the puerperal state appear more rare: of 2960 births in the Frauenklinik at Munich from 1884–87, there were reported 9 cases of retained placental fragments;¹ it is possible, however, that small portions of placental tissue might escape unnoticed in the lochial discharge, or else by their disintegration form a part of the discharge. The retention of placental tissue *in utero* does not always cause hemorrhage. I have seen a placenta succenturiata expelled on the second day of the puerperal state without any previous bleeding, and a very large piece of the placenta discharged four days after a premature birth, very fetid, but with no bleeding. In the 9 cases reported by Martini there was a prolongation of the bloody lochia in 1, a severe hemorrhage in 2; in 6 there was no excessive loss of blood.

The cause of the retention of placental fragments is either some abnormal form of placenta (*marginata*, *multiloba*, *succenturiata*, etc.), an abnormal adhesion to the uterine wall, or too forcible or premature efforts at extraction or expression.²

Retention of the membranes after labor is of frequent occurrence. Martini reports 71 cases out of 2960 births.³ Reihlen⁴ found a retention of some portion of the chorion in 152 out of 3534 labor cases (4.3 per cent.). Another investigation gave 5.1 per cent. from an analysis of 11,381 births. Credé⁵ reports 91 cases of retained chorion in 2000 births.

That membranes retained *in utero* may give rise to septic infection is now pretty generally admitted: whether or no they can be a cause of puerperal hemorrhage is still a disputed question. Credé⁶ has expressed his belief that retention of the chorion is not at all dan-

¹ Martini: "Ueber das Zurückbleiben von Eihant u. Placentarresten bei vor u. rechtzeitig. Geburt," *München, med. Wochenschr.*, 1888, 653.

² Ahlfeld in 996 deliveries saw only 4 cases of puerperal hemorrhage: he attributes the freedom from this accident in his clinic to his conservative management of the third stage of labor. He insists upon waiting one and a half hours before expressing the placenta (*Ber. u. Arbeiten*, Marburg, Bd. iii.).

³ *Loc. cit.*

⁴ "Zur Frage der Behandlung der Chorion-retention," *Arch. f. Gynäk.*, xxxi. 56.

⁵ *Arch. f. Gynäk.*, Bd. xvii. S. 278.

⁶ *Loc. cit.*

gerous. Olshansen has declared that the retention of chorion should never justify interference to extract it.¹ Reihlen² says that he never saw hemorrhage as a result of retained chorion. Schroeder³ asserts that retained amnion and chorion practically never cause bleeding even when retained in toto. On the other hand, Winckel⁴ and Hegar⁵ have shown that retained membranes could give rise to puerperal hemorrhage as well as to septicæmia. Martini reports 28 cases of retained chorion in which there was no fever—that is, no pathological condition, as uterine inflammation, decomposition of thrombi, etc.—to account for bleeding, and yet among these cases there were 2 severe hemorrhages, 8 of minor grade, and 6 times a prolongation of the bloody lochia.

That retention of decidua can be an etiological factor in puerperal hemorrhage there can, I think, be no doubt. If the decidua is hypertrophied during pregnancy, the amount of tissue retained *in utero* may be considerable—as much in rare cases as a large portion of the placenta. This may act as a foreign body within the uterine cavity, preventing firm contraction, and so predisposing to hemorrhage, or else, adhering to the uterine wall, may attract an unnecessary amount of blood to the whole organ, with the same result. Even a small portion of deciduous membrane, as well as shreds of adherent chorion and amnion or placental fragments, may form the foundation of polypoid tumors reaching occasionally considerable size, composed chiefly of firmly-clotted blood or fibrin.

The growth of these bodies is quite like stalactite formation on stone. The same thing occurs, in different shape, when the placental site is left unusually rough and vascular. The blood, oozing from the sinuses, may deposit successive layers of fibrin until quite a thick mass is formed.

DIAGNOSIS AND TREATMENT.—The fact that a portion of the ovum has been retained *in utero* is usually easy to discover. A careful examination of the secundines after labor will enable one to detect missing parts which must have remained behind in the genital tract. It is not wise, as a rule, to invade the internal genitalia in order to remove small shreds of amnion and chorion; if, however, a great part of these membranes has been retained, it would seem to the writer advisable to remove it. The diagnosis of retained placenta is, as a rule, easy. When the whole organ remains *in utero*, the cord dangling from the external genitals points clearly enough to the condition. If one or more cotyledons remain behind, their absence may be noted from the placenta after its

¹ *Klin. Beitr. zu Gynäk. u. Geburts.*, 1884, S. 146.

² *Loc. cit.*

³ *Lehrbuch*, 10te Aufl. 797.

⁴ *Berichte u. Studien*, 1874-79; *Path. u. Therap. des Wochenbettes*.

⁵ *Path. u. Therap. der Placental-retention*, 1862.

delivery. Occasionally, the diagnosis is more difficult, even if the whole placenta is retained. I recall a case in which a woman was delivered on her feet: the child dropped to the floor, the cord was dragged off from the foetal surface of the placenta, and the latter

FIG. 117.



Fibrinous Polyp (Fränkel).

remained behind in the uterus; it was tightly adherent to the uterine wall, and its discovery, with no cord to guide one, was by no means an easy matter. It was finally peeled off and extracted, the woman meanwhile bleeding furiously.

Cotyledons torn off the periphery of the placenta may easily go undetected, and in certain roughly lobulated placentæ it is very

difficult to be sure that no placental tissue has remained behind. If the medical attendant suspects the retention of placental masses after labor, he must attempt their removal. This is usually not difficult. The operator's hand—the only trustworthy instrument under the circumstances—is inserted into the uterine cavity, the placental substance felt for, caught by the fingers, and removed: if the placenta is adherent, the tip of a finger must be gently inserted, wherever most practicable, under the edge, and the whole organ gradually peeled off. If the uterine muscle is too firmly contracted to allow the introduction of the hand, the resistance must be overcome by firm, gradual pressure, first inserting one finger, then two, and so on till dilatation is effected. To accomplish this it is often necessary to administer an anæsthetic.

If puerperal hemorrhage occurs, the presence of membranes or placental fragments within the uterus should be suspected, and their removal be attempted unless some other condition is clearly seen to be the cause of the bleeding. To reach the uterine cavity after involution and retraction have made some progress, it is often necessary to dilate the cervical canal. Hegar's hard-rubber dilators will be found safest and most convenient for the purpose. Not rarely, however, the cervical canal remains patulous in consequence of the presence of a foreign body *in utero*; in this case access to the offending substance and its removal both become easier.

DISPLACEMENTS OF THE UTERUS.

The dislocation of the puerperal uterus will usually manifest itself in puerperal hemorrhage. Inversion, prolapse, displacements forward and backward and upward by a distended bladder, are all likely to be followed by excessive bloody lochia, if not by an active hemorrhage. Inversion and prolapse have already been considered; retroversion, retroflexion, and antelexion will be discussed here.

Hemorrhage is likely to occur in these displacements as a result of the passive congestion always seen associated with them, due to interference with the venous circulation; or the bleeding may be the consequence of the retention of blood within the uterine cavity, due to the mechanical interference with its escape: in the latter cases clots are formed, increasing gradually in size, often undergoing putrefaction, and acting not only as a foreign body, preventing uterine contraction, and attracting by their irritating action an extra amount of blood to the uterus, but constituting as well a favorable nidus for the development of septic germs, which may extend their operations to the thrombi at the placental site, disintegrating them.¹

¹ Five interesting cases of puerperal hemorrhage due to uterine displacement are reported by Gräfe in *Ztsch. f. Geburtsh.*, xii. 323.

The causes of flexions in the puerperal state are the increased weight of the puerperal uterus with a loss of tonicity. They are therefore not infrequently associated with subinvolution. Backward displace-

FIG. 118.



Frozen Section of Puerperal Uterus in a State of Ante flexion (Stratz).

ments are most frequently the result of some sudden physical effort soon after leaving the bed, especially if the woman has risen too early,

FIG. 119.



Retroflexion of Puerperal Uterus (Schatz).

before involution has sufficiently far advanced. Another common cause is the faulty application of a compress under the binder. Many nurses will, unless they are properly directed, place a thick compress in direct relation with the anterior uterine wall, thus crowding the whole organ backward, instead of adjusting it over the fundus of the uterus, where it will maintain a condition of anteversion, and by constant pressure promote firm contraction and rapid

involution. Retroversion and retroflexion may persist after premature delivery if these displacements existed during pregnancy.¹ Neglect

¹ Schatz: *Arch. f. Gynäk.*, Bd. i.

to empty the bladder at proper intervals may be found a cause in some cases. In extreme examples of this kind the uterus is pushed far upward, backward, and usually to the right side.

DIAGNOSIS.—This is easy if a careful physical exploration is made; and it should be an invariable rule to make a vaginal examination in every case of puerperal hemorrhage. It is not rare to find some portion of the ovum or blood-clots retained within the uterine cavity in consequence of the “stenosis by angulation” of the cervical canal.¹ It is therefore not sufficient to rest satisfied with the diagnosis of displacement in puerperal hemorrhage, but it is necessary to be sure there is nothing detained within the uterus. It should be remembered that there may be not hemorrhage, but, for a time, suppression of the lochia with displacements of the uterus. Occasionally the dislocation may occur rather acutely and be associated with grave symptoms, as intense pain and a condition verging on shock.

TREATMENT.—The treatment of puerperal hemorrhages due to a displaced uterus is the rectification of the displacement. This will occasionally be followed by the expulsion of blood-clots or remains of the ovum, which, imprisoned within the uterus, were the true causes of the bleeding.² The uterus, restored to its natural position, should be retained there, for a while at least, by some mechanical support.

DISLODGMET AND DISINTEGRATION OF CLOTS AT THE PLACENTAL SITE.

The thrombus formation in the large sinuses at the placental site plays a very important part in the prevention of hemorrhage after delivery. In consequence of sudden exertion, sitting upright in bed, or actually standing on the floor soon after labor, some of these clots, plugging up important vessels, might be dislodged. It is with this possibility in mind that every precaution should be taken to secure repose and quiet after labor. Fordyce Barker's advice on this point, as on others in obstetrics, is most excellent: If it is necessary that the patient should be raised for any purpose to a sitting posture in bed, the nurse is directed to exert constant firm pressure over the fundus, and to readjust the binder when the patient again lies down. For some time afterward a careful watch is kept for bleeding. Disintegration of the clots at the placental site occurs occasionally in consequence of their invasion by the microbes of animal putrefaction; this is, therefore, one

¹ Fernley: *Brit. Med. Journ.*, 1888, ii. 739.

² Strachan reports an interesting case of the kind associated with ante flexion. Six weeks after labor there was a severe hemorrhage; the uterus was straightened by upward pressure through the anterior vaginal vault; the following day a cotyledon of the placenta was discharged (*Br. Med. J.*, 1886, i. 587).

of the phenomena of puerperal infection. The bleeding that follows is "of all puerperal hemorrhages by far the most dangerous" (Schroeder).

DIAGNOSIS.—The hemorrhage that follows displacement of thrombi at the placental site is startling in its suddenness, alarming in the amount of blood lost. There need be nothing in the uterine cavity to account for it; the uterus may be in good position. The true condition can of course only be inferred.

TREATMENT.—The best plan in this form of hemorrhage would be to adopt Dührssen's mode of treatment. It is thus described by its author:¹ He takes with him to every case of labor a strip of 20 per cent. iodoform gauze 3m. long, two handsbreadth in width, in four layers. On this is scattered loose iodoform powder. To tampon the uterus the anterior lip of the cervix is seized as high up as possible with two bullet-forceps; the strip of gauze is then caught by the end in a long pair of forceps and introduced within the uterus. As soon as the point of the forceps enters the uterine cavity the left hand grasps the fundus, and only then is the forceps pushed in as far as it will go. The forceps is then loosened, withdrawn a little, a lower portion of the gauze strip seized, and so the uterus is filled with the gauze lying in fan-shaped folds. "It is astonishing," says Dührssen, "how soon the uterine cavity is filled." The uterus is stimulated to contraction, so one gets the combined advantage of a tampon and a uterine stimulant. When the gauze is removed it has very few blood-clots in it, and has not a trace of putrid odor. Dührssen proposes his method for use in post-partum hemorrhages due to inertia. He makes the confident assertion that whoever employs this plan will never lose a patient from hemorrhage due to *atonia uteri*.

EMOTIONAL CAUSES.—Sudden emotion of any kind will arrest uterine contraction during labor and in the puerperal state. In the latter condition the usual result is a hemorrhage which may be alarming in quantity. Barker² gives a most interesting example: a healthy young primipara almost bled to death in the second twenty-four hours after labor in consequence of the brutal conduct of her husband, who was disgusted that his child was a girl. I have seen a sudden and profuse hemorrhage on the seventh day, the result of fright; the patient's stepson returned late at night in a violent state of intoxication.

RELAXATION OF THE UTERUS.

This is a rare cause of hemorrhage after the first twenty-four hours. Barker asserts that he has never met with it later than the third day,

¹ "Die Uterus-tamponade, mit Iodoform-gaze bei Atonie des Uterus nach normaler Geburt," *Centrbl. f. Gynäk.*, 1887, xi. 553.

² *The Puerperal Diseases*, p. 15.

and that when it occurs after the first twenty-four hours it is in women of depressed mental and physical condition, exhausted by prolonged labor, weak from insufficient food or bad hygienic surroundings. It is to be treated on the same general principles as primary post-partum hemorrhage from the same cause.

RETENTION OF BLOOD-CLOTS.

This is usually the result of uterine relaxation, uterine displacements, or a retention of portions of the ovum, around which the clot is formed. If these conditions are promptly treated, the retention of blood-clots will be prevented. The effect of a clot of any size retained *in utero* is often hemorrhage, possibly septicæmia. It is of course to be removed as soon as the symptoms lead the medical attendant to suspect the presence of a foreign body within the uterus.

FIBROIDS.

If the puerperal state is complicated by intramural or submucous fibroids of the uterus, there will be certainly a prolongation and increase in amount of the bloody lochia, possibly a serious hemorrhage. The latter is peculiarly liable to happen if the tumor assume the shape of an intra-uterine polyp. Barker¹ gives four interesting cases of the kind. The diagnosis is only to be made by a careful physical exploration. The best treatment is the removal of the growth by scissors after ligature of the base or with the wire *écraseur*. In case this treatment cannot be carried out, and in other forms of fibroid tumors in the puerperal state, ergot with quinine and strychnine, and the daily application of the faradic current, will do much to secure firm uterine contraction and prevent hemorrhage.

HÆMATOMATA.

Blood-tumors along the genital tract may burst during the puerperal state, with most serious external hemorrhage. This matter will be referred to later.

PELVIC ENGORGEMENT.

Congestion of the pelvic blood-vessels may lead to puerperal hemorrhage. The congestion may be due to heart, kidney, or liver disease; to increased intra-abdominal pressure from any cause; to the determination of blood toward internal organs during a chill;² to premature sexual intercourse; to the crethism following the return of the husband to the

¹ *Loc. cit.*

² Winckel (*Path. u. Therap. des Wochenb.*) reports 4 cases of this kind out of 114 of puerperal hemorrhage. I once met with a striking example during a malarial attack some days after labor.

wife's bed; to inflammations about the uterus; to subinvolution from any cause; to ovarian irritation (Barnes); to constipation. Mauriceau¹ describes a case of puerperal hemorrhage that continued quite profusely for five or six days, and which was only stopped when "a pretty strong elyster" resulted in the evacuation of "a painful of gross excrements."

WOUNDS IN THE GENITAL TRACT.

Secondary hemorrhage may occur from wounds in the cervix, vagina, and vulva. Occasionally, abnormally large blood-vessels are injured in these regions: on one occasion I saw a hemorrhage from an anomalous artery in the perineum that nearly proved fatal. A medical student who had charge of the case stood idly by while the blood spurted out from the lacerated perineum in large jets: when I arrived the woman was pulseless and intensely anæmic; she subsequently died from septic infection. It is possible that a vessel of considerable size might be wounded during labor, and yet, in consequence of pressure from the child's head or of an unstable plug of clotted blood, would not bleed until, at some time in the puerperal state, the tissues recovering their tone or the clot being dislodged, hemorrhage would occur. Barker describes a case of this sort in which there was on the second day arterial hemorrhage from one labium.

The DIAGNOSIS is easily made if the parts are exposed to view. The bleeding vessel may be detected and should be ligatured.

CARCINOMA OF CORPUS AND CERVIX.

Carcinoma has been known to develop at the placental site during childbed. Chiari² reports three cases in a single year of carcinoma at the placental site ending fatally within six months after labor. Delivery had in each instance been spontaneous: repeated hemorrhages had occurred during the puerperal state. Kucher³ reports a case in which death followed much earlier than in the above instances. The patient, seen fourteen days after spontaneous delivery, was suffering from repeated hemorrhages. A few weeks afterward she died; the post-mortem examination revealed carcinoma of the corpus uteri. Epithelioma of the cervix, if at all advanced, must surely, among other disastrous consequences, entail a danger of hemorrhage. The diagnosis of corporeal cancer would be practically impossible during life. The only reliable treatment of hemorrhage from this cause would be a uterine tampon after the method of Dührssen. A vaginal tampon would control the bleeding from a carcinomatous cervix.

¹ *Diseases of Women with Child and in Childbed*, tr. by Hugh Chamberlen, London, 1752.

² *Med. Jahrb.*, iii. 887.

³ *Puerperal Convalescence and Diseases of the Puerperal Period*, New York, 1886, p. 79.

As rare causes of puerperal hemorrhage might be mentioned rupture of the uterine artery, as occurred in a case reported by Hewitt,¹ with a fatal result six weeks after labor; the rupture of a distended vein in the cervix, followed by fatal bleeding, as happened in a case described by Hecker.² Meschek³ reports a similar case, with like result, due to an eroding ulcer which opened a large vessel in the cervix. Johnston tells of a fatal puerperal hemorrhage due to rupture of a hæmatoma of the cervix.⁴

PUERPERAL HÆMATOMA.

A form of hemorrhage in the female genitalia during or after labor, much more rare than the secondary hemorrhages just described, is an interstitial effusion of blood, with the consequent formation of a blood-tumor varying in size with the degree of the hemorrhage. Levret seems to have been familiar with this accident, but with this exception a knowledge of the nature of hæmatomata in puerperæ is confined to quite recent times. The first systematic treatise on the subject is Deneux's monograph.⁵ It was also fully described by Dewees,⁶ professor of obstetrics in the University of Pennsylvania. Of late years the literature relating to this complication of the puerperal state has become quite extensive, and much has been accomplished in adding to the knowledge of the subject, especially as regards prognosis and treatment. In this country Fordyce Barker is justly regarded as the ablest and clearest exponent of the best therapeutic measures to adopt. The accident, as has been stated, is of rare occurrence, but individual experience differs widely as to its frequency. Deneux was able to collect 62 cases, but had himself only seen 3 in a practice of fourteen years. Paul Dubois saw but 1 case out of 14,000 labors. Velpeau,⁷ writing five years after the appearance of Deneux's article, declared it would be easy to collect the detailed accounts of 100 cases—that he himself had seen 25. Barker of New York reports 22 cases that came under his personal observation. Winckel quotes Clintoek's claim that he had observed 25 cases, and places an exclamation-mark after the quotation, evidently as a sign of incredulity.⁸ The former has only met with 6 well-marked cases in an experience of almost 20,000 confinements. Bossi found hæmatoma twice among 5660 women in child-bed; Hugenberger, 11 times in 14,000 deliveries; in Vienna it was

¹ *London Obstet. Trans.*, vol. ix.

² *M. f. G.*, Bd. vii. S. 2.

³ *Ztschr. d. Ges. d. Wien. Aerzte*, 1854, x.

⁴ Sinclair: *Pract. of Midwifery*, 1858, p. 501.

⁵ *Tumeurs sanguines de la Vulve et du Vagin*, Paris, 1830.

⁶ *Diseases of Females*.

⁷ *Traité complet de l'Art des Accouchemens*, Brussels, 1835.

⁸ *Lehrbuch der Geburtshülfe*, 1889.

noted 18 times out of 33,241 births.¹ This would indicate a frequency of 1 to 1600 births.

SITUATION.—This is most frequently, by far, in one or the other labium majus, rarely in both. The blood-tumor may, however, occupy a position beneath the vaginal wall, to either side, or posteriorly and anteriorly in the labia minora; in the caruncula myrtiformes; under the skin of the perineum, between the superficial and median fascia; in the cervix; in the periuterine connective tissue; within the broad ligament; in the subperitoneal connective tissue, on the posterior and anterior abdominal walls, extending as high as the kidneys and navel (Cazeux, Hugenberger, Winckel); under the skin of the mons Veneris or over the inguinal ring (Velpeau). If the effusion occur above the pelvic fascia, the blood is apt to force its way upward toward the diaphragm; if below, downward toward the vulva.

SIZE AND FORM.—Barnes² says that post-mortem examinations have convinced him that small extravasations of blood are to be met with along the genital tract universally after labor: this diffuse thrombus is due to the fact that the mucous membrane is pushed in front of the presenting part with a glacier-like movement over the underlying tissues, and there thus occurs a rupture to some degree of the submucous connective tissue and the small blood-vessels contained in it. Winckel has seen numerous hæmatomata after labor, varying in size from that of a pigeon's egg to that of a walnut. It is the larger tumors that are more rare. They may vary in size from that of a hen's egg to that of a child's head; in extreme cases, where the blood is diffused throughout a great part of the subperitoneal connective tissue, the size would be very large were the blood contained within a limited circumscribed tumor.

In shape these blood-tumors of the genital tract are most often globular; in the cervix they distend the tissues of one or both lips downward and outward, assuming somewhat the form of a shark's nose. In the vagina they may hang from the anterior or posterior wall in the form of a polyp (Fleischmann).

ETIOLOGY.—The predisposing causes of puerperal hæmatoma are the engorged condition of the blood-vessels along the genital tract, and the strain that is imposed upon them either by the pressure of the foetal mass or the great muscular effort put forth during labor. The more engorged the vessels are, the likelier is the occurrence of hæmatoma. Winckel says it is self-evident that varicose veins predispose to this accident. Barker, however, denies this emphatically. It is certainly true that many a case of varicose veins may be met with before a

¹ These latter statistics are taken from Winckel's book, where a reference to the original authorities may be found.

² *System of Obstetric Medicine and Surgery.*

hæmatoma is seen, and in many instances of the latter the veins were in no wise affected. Halliday Croom,¹ attaches great importance to anteversion of the parturient uterus as a predisposing cause of vaginal hæmatoma, believing that thus an excessive strain is put upon the whole posterior vaginal wall, and a rupture of distended blood-vessels in this region rendered more probable. This explanation seems reasonable, but it leaves unexplained the hæmatomata in other situations along the birth-canal. Hypertrophic elongation of the cervix certainly predisposes to the formation of hæmatomata in that region during and after labor. The determining cause of this accident may occasionally be found in direct injury to the tissues by forceps, and rarely by a fall or a blow, or it might be explained by violent straining efforts during the second stage of labor. In the majority of cases, however (86 per cent. Winckel), the occurrence of these blood-tumors will be apparently spontaneous. The immediate cause of the hæmatoma is the rupture of a blood-vessel and the interstitial extravasation of blood; the vessel injured is commonly a vein, not rarely of large size. Possibly, a number of smaller vessels may be ruptured. The injury to the blood-vessels is either a direct and immediate laceration, or else later a perforation by pressure necrosis.

CLINICAL HISTORY AND DIAGNOSIS.—The interstitial hemorrhage that results in a hæmatoma begins, with rare exceptions, during labor: it may at first be quite gradual, so that it does not attract attention until some time in the puerperal state. The distension of the vagina by the presenting part of the fœtus may prevent all bleeding until the maternal tissues are relieved of pressure and regain to some extent their natural tone. Or if the bleeding results from necrosis of tissue, the result of prolonged pressure, the formation of a hæmatoma may first begin after delivery. In cases where this has seemed to be the result of violent coughing or other exertion during the childbed period, there had been no doubt some injury done the vessels during the process of parturition. The subcutaneous or submucous laceration of tissue occurring, as a rule, during the second stage of labor, is almost always associated with great pain of a sharp, lancinating character quite different from labor-pains. The suffering increases as the hæmatoma grows in size, and in addition to the sharp pain of torn tissue there is developed exaggerated and painful expulsive action on the part of the uterus, excited by the presence of the tumor within the vagina. This is a symptom almost constant, but Barker tells of a painless case, and says that his is not the only one recorded. The hemorrhage into the tissues may be profuse enough to occasion the most marked signs of acute anæmia. Pallor of the countenance, failure of vision, a thready pulse, that sound between a gape

¹ "On the Etiology of Vaginal Hæmatoma occurring during Labor," *Edin. Med. Journ.*, vol. xxxi. pt. 2, p. 1001.

and a sigh, loss of consciousness, and finally death, may all be noted without the slightest external escape of blood. An examination of the patient will reveal a tumor occupying the situations already described, of varying size, and differing in consistency as the blood contained in it is fluid or clotted; if the hæmatoma is submucous, it presents a dark purplish color like clotted blood; if it is covered with skin, it presents a bluish, ecchymotic hue. As a rule, the swelling only appears after labor; it may, however, occur before the expulsion of the child, and it has repeatedly developed between the birth of twins.¹ If the tumor is formed during labor, it may present a formidable obstacle to delivery; if it appears in the puerperal state, it may dam back the lochia or give rise to ischuria or retention of feces. With the history of a sharp attack of pain during labor the subsequent rapid development of a tumor along the genital tract characteristic in its appearance and situation, the signs of internal hemorrhage, the diagnosis of the true condition ought not to be difficult; and yet a mistake is quite possible. Winekel says that puerperal hæmatoma has been confused with varicose tumors of the labia, inguinal hernia, and inversion of the vagina. Once in Barker's experience a vaginal hæmatoma was mistaken for a foetal head, and once for placenta prævia. Auvard² says that on first sight he took a hæmatoma of the anterior lip of the cervix for a clot of blood lying in the vagina; the Barneses,³ in describing their case of cervical hæmatoma, write that they found a fleshy tumor projecting from the vulva which looked like a mass of coagulated blood or which might have been mistaken for an inverted uterus. The diagnosis would, it seems, be more difficult in cervical hæmatomata than in those lower down in the genital canal. Luckily, the former are rare. Besides the two just mentioned, others are described by Hohl, Braun, Earle (2 cases), and Winekel.⁴ Hæmatomata along the genital canal may burst soon after their formation, with appalling hemorrhage which may rapidly prove fatal. In cases of labial tumors the point of rupture is likely to be the boundary-line between the greater and lesser labia (Winekel). A hæmatoma within the pelvis may open into the peritoneal cavity with fatal hemorrhage. After early rupture or primary incision of the tumor the hemorrhage will almost surely be great, and there is apt to occur secondary bleeding. This does not happen, as a rule, when the tumor is opened after bleeding into it has ceased.

Winekel thus summarizes the termination of puerperal hæmatoma: (1) Death by hemorrhage with or without previous rupture of the tumor;

¹ One case reported by Dewees (*Diseases of Females*, "Of Bloody Infiltration in the Labia Pudendi") and six by Madame Sasanoff (*Annales de Gynécologie*, December, 1884). Four of these latter cases died.

² *Trav. Obstet.*, Paris, 1889, t. i. p. 449.

³ *System of Obstetric Med. and Surg.*, Philadelphia, 1885.

⁴ *Lehrbuch*, 1889.

(2) death following suppuration of the sac and septicæmia, most frequently after the sac has been opened; (3) rupture of the tumor, with recovery; (4) rupture of the tumor, with a resulting fistula; (5) perfect recovery by absorption of the effused blood, without rupture of the sac. In 50 cases collected by Winckel from modern literature the tumor burst spontaneously within the first eight days in 23. A hæmatoma may be evacuated not only by escape of the contained blood externally, but by diffusion of its contents under the skin. Dill¹ reports a case of large hæmatoma of the right labium which burst, and at the same time occasioned ecchymoses reaching to the nates and the right knee, to the umbilicus, and even as high as the right axilla. Suppuration may occur in a blood-tumor that has not been ruptured at all, and the effused blood may be converted into a large collection of pus. As these abscesses are often in the neighborhood of the rectum, the pus often acquires a fecal odor, even without a communication with the bowel. There can, however, result a recto-vaginal fistula if the hæmatoma breaks its way into the rectum and bursts or is opened anteriorly into the vagina. More commonly the fistulæ following hæmatomata open from the vagina upon the perineum. Fistulæ follow hæmatomata in 4 per cent. of all cases (Winckel). Suppuration is most to be feared after the blood-tumor is opened and its cavity exposed to the germs of the atmosphere as well as to those contained in the lochia. The contents of the tumor offer a most suitable nidus for the growth of pathogenic micro-organisms, and the large absorbing surface of the tumor-wall gives ready access to the system for microbes and the products of their activity.

PROGNOSIS.—The formation of a hæmatoma during or after labor was formerly regarded as a more dangerous complication than it is considered to-day. Of Denoux's 62 cases, 22 died. Fatal cases have been reported by Cazeaux, Lubanski, Broers, Seulen, Josenhans, Hugenberg (4), and Braun (Winckel). The causes of death in these cases were hemorrhage (in one instance into the peritoneal cavity), septicæmia, and typhoid fever. Blot collected 19 cases since Denoux's paper was published, with 5 deaths. Perret, in an analysis of 43 cases, found 17 deaths. Of 11 cases observed by Hugenberg,² 4 died. Girard,³ from an analysis of 120 cases, found 24 deaths. Johnston and Sinclair⁴ report 7 cases during seven years' service in the Dublin Rotunda, with 2 deaths. Seanzoni met with 15 cases, 1 of which died. Winckel, among 50 cases, found only 6 deaths. Of the 6 cases in his personal experience, not one died. Barker reports 22

¹ *Dublin Journ. Med. Sci.*, Nov., 1886.

² *St. Petersburg. Med. Zeitung*, 1865.

³ "Contribution à l'Étude des Thrombes de la Vulve et du Vagin dans leurs Rapports avec la Grossesse et l'Accouchement," *Thèse de Paris*, 1874.

⁴ Barker: *loc. cit.*

cases of his own—13 in hospital, 9 in private practice; among the former, 2 died. Barnes¹ reports 2 cases with favorable issue; Anvard,² 1 of cervical hæmatoma that disappeared by absorption. Croom's 3 cases all recovered. Now that the nature of the accident is well understood, that the means of checking hemorrhage and preserving an aseptic condition about the wounded part are much improved, death from puerperal hæmatoma should be rare, especially if the patient's general condition is good and her hygienic surroundings satisfactory.

TREATMENT.—If the hæmatoma is of moderate size, not larger than one's fist, the main object of treatment is to secure absorption of the effused blood, and thus the disappearance of the tumor. This is by far the most favorable issue of these tumors, for when it is possible the women run no risk of septicæmia and hemorrhage, the two chief dangers associated with puerperal hæmatomata. It may, however, be necessary to remove an obstruction to labor when one of these tumors develops before delivery; to control the hemorrhage either before or after rupture of the sac; to treat the general symptoms of profuse bleeding; to evacuate the contents of the sac when suppuration has occurred; and to prevent septic infection.

To secure the disappearance of a hæmatoma by absorption cleanliness of the parts and rest are to be secured. If the tumor is vaginal or cervical, frequent antiseptic injections would be advisable; if the effusion is subcutaneous, cooling lotions and inunctions with oil or cosmoline will often prevent inflammation and rupture of the sac. If the tumor appears before or during labor, and offers an obstacle to the delivery of the child, it must be freely opened; the contents, whether fluid or clotted blood, evacuated; pressure exerted by the hand of an assistant, aided perhaps by a tampon of iodoform gauze, in order to check the hemorrhage; while the extraction of the infant by the forceps or after version is hastened as much as possible. To control the hemorrhage into the tissues before external rupture has occurred, pressure, cold, and the internal administration of ergot may be tried. An ordinary tampon in the vagina is not admissible, for it would dam back the lochial secretion, would become, moreover, saturated with it, and favor decomposition of the putrescible discharges caught in its meshes. Bram's colpenynter, distended with ice-water, will answer the purpose better, for it can be easily removed at frequent intervals to allow an antiseptic irrigation of the vagina. It is well not to open the tumor while it is increasing in size, for there may be profuse hemorrhage at the time, and a secondary bleeding later. This does not occur, as a rule, when the tumor is incised after the effusion ceases, and yet there are two cases on record in which hemorrhage occurred from tumors opened one and three weeks after their formation.³ If the tumors are

¹ *Loc. cit.*

² *Loc. cit.*

³ Parvin's *Obstetrics*, p. 502.

too large to be absorbed, or if there is threatened gangrene of their coverings, they should be opened.

Many hæmatomata burst within the first few days after their formation: there may be, in consequence of the rupture, an alarming hæmorrhage. In such cases it is best to enlarge the opening, turn out the clots within the tumor, search for the bleeding vessel or vessels, which may be seen spurting from the walls, and apply a ligature. If this is impossible and bleeding still continues, the cavity may be firmly packed with iodoform gauze, firm external pressure being exerted by a pad of antiseptic wool and a bandage. It is better, if it can be avoided, not to use the styptic salts of iron, for such a firm, dense clot is thus formed that it takes a long time for it to disintegrate, the woman meanwhile running a risk of septicæmia.

After the coverings of a hæmatoma are incised or ruptured, suppuration will commonly occur in the cavity; septicæmia must be avoided in such cases either by an antiseptic tampon in the abscess-cavity often renewed, or else frequently-repeated antiseptic injections. Suppuration may occur before the tumor has been opened at all. In such cases the pus must be evacuated. The opening should not be delayed too long, especially in suppurating hæmatomata of the posterior vaginal wall, or fistulæ may result. The general treatment for loss of blood is to be conducted in the ordinary manner when the indications call for it—hypodermies of ether, brandy, and hot animal broths internally; copious draughts of hot water, “auto-infusion” by bandaging the limbs; and possibly actual intravenous infusion of a weak saline solution.

NON-INFECTIOUS FEVERS.

Fever in the puerperal state not due to infection may arise from emotional causes, from exposure to cold, from constipation, from reflex irritation of any kind, from cerebral disease, from eclampsia, from insolation, from syphilis, from the exacerbation or persistence of an acute or chronic disease contracted during or before pregnancy. The limitation of the heading under which these affections are grouped excludes all consideration of septic infection and of the infectious fevers, as the exanthemata, erysipelas, typhoid fever, malaria, pneumonia, which will be dealt with in another place.

Emotional Fever.—With the modern view of fever—that there must be a disturbance in the nerve-centres which govern heat-dissipation, heat-production, and the relations between them¹—there is nothing at all incompatible in classifying certain elevations of temperature as purely nervous in origin; that is, with no lesion of thermic centres,

¹ Welch: “Cartwright Lectures on the Pathology of Fevers,” *Medical News*, 1888, 365 *et seq.*

no irritation of them by foreign matters in the blood, but simply a nervous stimulation or a disturbance of balance in the heat-controlling regions, occasioned by some profound psychical impression, as grief, anger, fear. Admitting,¹ as one must, that, after direct injury, stimulation or disease of certain regions in the brain or spinal cord, fever will surely develop,² it is easy to go one step farther and assume that the normal action of these centres may be disturbed by some powerful emotion which profoundly affects the higher cerebral functions.

Another theory of fever after emotions deserves at least some consideration. It is possible that the mental action produces a change in the composition of the blood or of the fluids in glands and muscles which, it is well known, take a part in heat-production. It is possible that thus a thermogenic leucomaïne is manufactured.

There are some who would perhaps look to the vaso-motor nerves for an explanation of emotional fever, expecting excitation or paralysis as they are followers of Traube or Marey.

That fever may appear in consequence of emotions, clinical evidence leaves no doubt. The explanation of its occurrence is of minor importance in comparison with a knowledge of the fact, for a comprehension of the former will not be required to treat such cases properly, if, indeed, they demand treatment at all: the cause of the fever being transient, perhaps momentary, the elevated temperature quickly sinks to normal. It is not in every person that powerful emotion will be followed by an elevation of temperature to a noteworthy degree. There must apparently be predisposing causes in the nervous system of the individual. Emotional fever is not seen in men with well-poised minds used to the vicissitudes of life, opposing a resisting front to external impressions. It is most often met with in children, in hysterical girls,³ and in women after childbirth. In these conditions, childhood hysteria, and childbed, there is a curious irritability of the organism, a lack of control over the mental processes. The petulant child, easily swayed by and completely yielding to emotions, subject on slight provocation to convulsions, is a familiar picture; and no one can overlook this same mental and nervous character in pregnancy and the early part of the puerperal state. It is this condition of the nervous system, apparently, that predisposes to emotional fever. Some time ago I had

¹ White: *Guy's Hospital Reports*, 1884, p. 49, "The Theory of a Heat-centre from a Clinical Point of View."

² Welch quotes the case reported by Sir Benjamin Brodie, in which an injury to the spinal cord in the cervical region was followed by a temperature of 111° Fahr. The fact that puncture with a fine needle of the anterior part of the caudate nucleus is followed by a rise of temperature to three degrees or more is also verified by this author. It is claimed that there are three other heat-controlling regions in the brain.

³ The case reported by Dr. Mahomed is a famous example: the temperature is said to have reached 128° Fahr. (*Lancet*, 1881, vol. ii. p. 790).

under my care in the infant asylum of the Philadelphia Hospital a young child who was frequently thrown from slight cause into violent fits of anger. Immediately after these paroxysms the temperature would be raised, sometimes to 103° . Within an hour the fever disappeared.

Lawson Tait read before the London Obstetrical Society a paper entitled "Some Observations on Puerperal Temperatures," based on records of 125 cases in which the temperature was taken every four hours: almost all of them had fever, and in quite a large number it was attributed to nervous origin. The number is doubtless over-estimated, for emotional fever in the puerperal state is not so frequently seen as these statistics would lead one to suppose. Hunt's¹ records of 75 cases, confined to women free from infection and inflammation, in which the temperature was taken twice a day in the mouth, gives three apparently typical examples of fever from emotion. In one the cause is put down as "acute domestic infelicity;" in another, as ill-usage; and in the third, as anxiety. In the Maternity Hospital, designed for the reception of young girls illegitimately pregnant for the first time, I

FIG. 120.

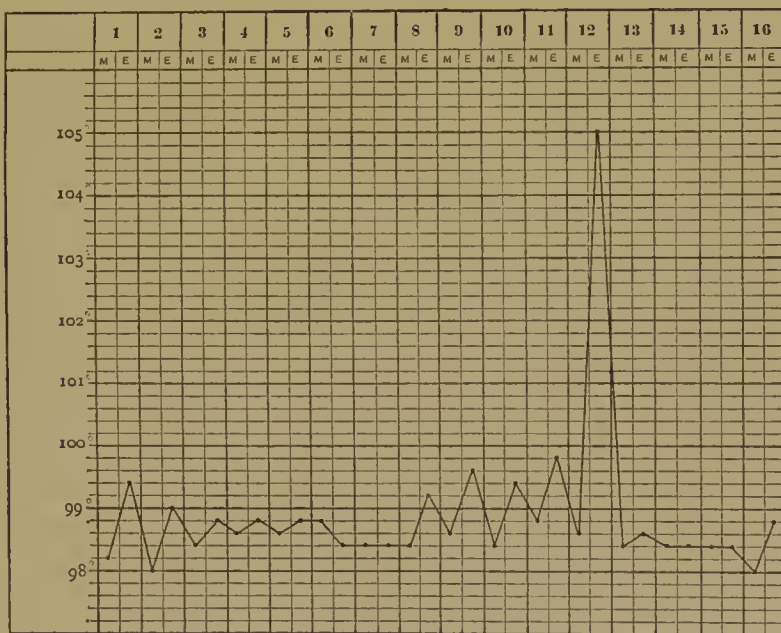


Chart of Emotional Fever from Dread of an Operation.

have seen many examples of emotional fevers. Failure to receive an expected letter, fear of exposure, the expected removal of the infant to an asylum, and dread of an operation for mammary abscess, have all been discovered as causes of the marked mental disturbance that produces

¹ "Normal Course of Puerperal Temperature," *Practitioner*, London, 1888, p. 81.

fever. The last-mentioned cause furnished perhaps the most typical case. There had been in the ward one operation for suppuration in the breast; it was witnessed by two puerperal patients. One of these, a young girl, shortly after experienced pain in the breast; she at once conceived a morbid dread of an operation. The beginning elevation of temperature in the chart indicates the commencement of engorgement and pain in the breast. This went on for a few days, when, after having lain awake all night brooding on the subject, the girl's temperature began to rise in the morning, finally reaching the height indicated on the chart. The most effective antipyretic employed was the emphatic assurance of the resident physician that there was not, and would not be, the slightest excuse for an incision of the breast. The patient's fears being calmed, her temperature quickly sank to normal, where it remained.

FEVER FROM EXPOSURE TO COLD.

In the sensitive condition of puerperæ it is not uncommon to see a febrile reaction follow undue exposure. A careless nurse or attendant may be responsible for too low a temperature in the lying-in

FIG. 121.

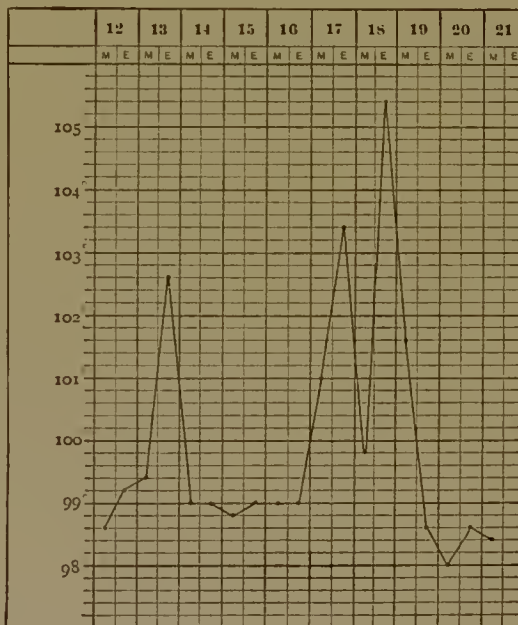


Chart of Fever Case from Exposure to Cold.

room, or for ill-regulated ventilation, or for insufficient or ill-arranged bed-clothing. A wilful patient may leave her bed too soon and expose herself, thinly clad, to cold. I have seen a good illustra-

tive case in the Maternity Hospital: it occurred in midwinter. Kate B——, a private patient, left her bed on the twelfth day after labor, without permission and very imperfectly dressed: some disturbance in the street attracted her to the window, where she stood quite a long time looking out. On the following day she had fever; she was kept in bed for four days, and on arising was again imprudent about her apparel. The fever returned with sharp pain in the abdomen, which was relieved by turpentine stupes. There was no infiltration to either side of the uterus, no evidence of infection. Finally, with greater care for body-warmth, the woman left her bed and was troubled no more.

CONSTIPATION.

Schroeder¹ says that “among the causes, aside from infection and local inflammations, which, with special frequency, produce fever in the puerperal state, over-distension of the intestines with fecal masses should be given a foremost place.” This statement of an eminent authority assigns too important a rôle, I think, to constipation among the causes of elevated temperature after delivery. Every practitioner

FIG. 122.

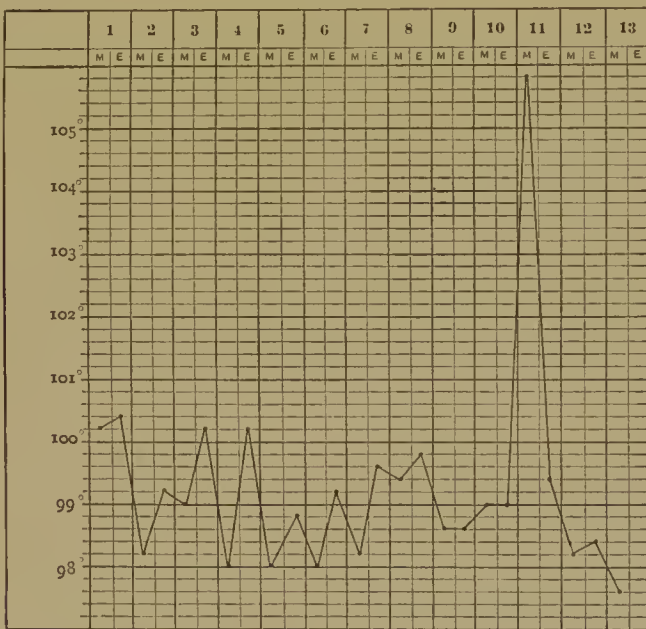


Chart of a Woman constipated for six days in the latter part of the Puerperal State.

of obstetrics, however, has doubtless seen an example of this sort of puerperal fever.

The temperature chart (Fig. 122) is from a woman in the Philadelphia Hospital who had had but one evacuation of the bowels—on the

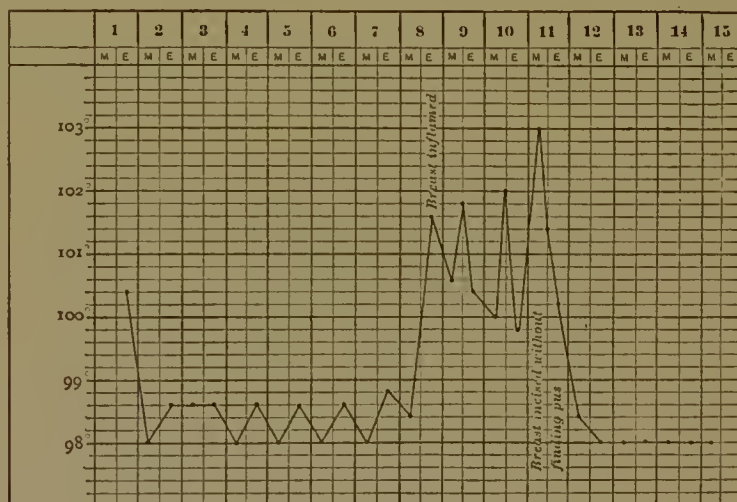
¹ *Lehrbuch*, 8te Aufl. S. 803.

fifth day—in the eleven days succeeding delivery. The temperature rose to a great height, but fell almost immediately after the administration of an enema containing an ounce each of glycerin and hot water.

FEVER FROM REFLEX IRRITATION.

Physical irritation, as well as psychical, is often reflected in general elevation of the body-temperature during the puerperal state. The irritating point is most often to be found in the breast. It is quite true that "milk fever" as a constant occurrence in the puerperal state should no longer be looked for since the advent of antiseptics. But, nevertheless, there may be found in women of sensitive nervous organism a well-marked fever which can be traced to no other cause than the engorgement and distension of the breast. The appended temperature chart (Fig. 123) well illustrates this point. A young primipara

FIG. 123.



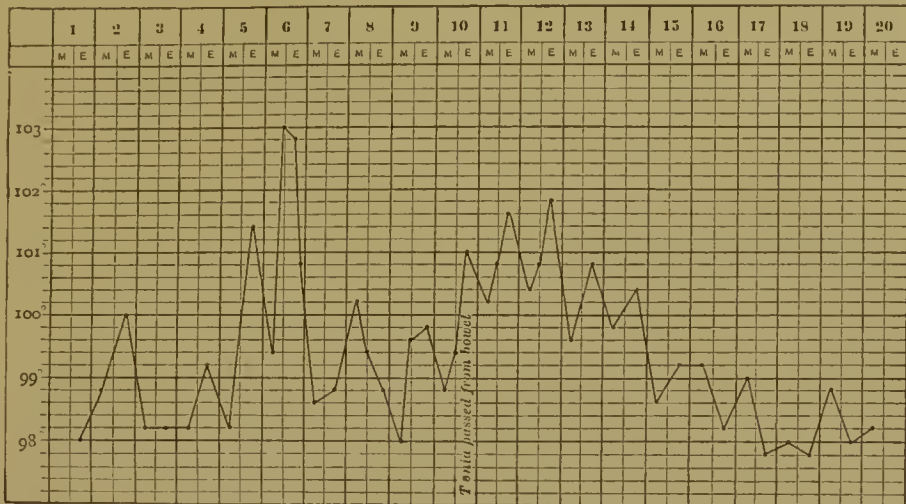
Reflex Fever from Mammary Congestion.

developed on the eighth day of the puerperal state apparently an acute mastitis. The pain, the redness of the skin, the swelling of the breast, and the course of the temperature, all led me to believe that suppuration had occurred. Consequently, I cut deeply into the gland: there was free bleeding, but not a drop of pus was found. Immediately after the incision, which relieved the engorgement of the breast and the tension of the skin, the temperature began to fall with unbroken descent to normal.

The focus of irritation is not always the mammary gland. A year ago I saw a most curious complication of the puerperal state. A rather elderly primipara was delivered without difficulty of a healthy infant. During the early part of the puerperal state the woman began to com-

plain of a constant and distressing headache; diarrhoea came on, which resisted treatment, and the woman's mental state tended rapidly toward

FIG. 124.

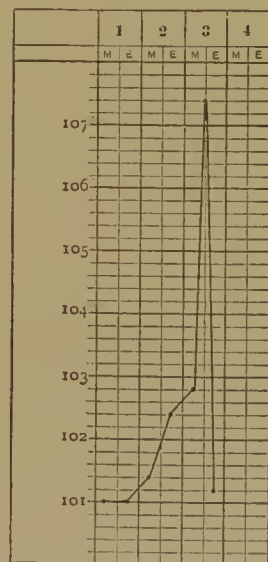


Fever followed by Expulsion of Tape-Worm.

pronounced melancholia. With it all, the temperature rose in a suspicious curve. On the ninth day the body of a tapeworm, fourteen and a half feet long, was passed from the bowel, and shortly afterward the temperature dropped to normal.

It has seemed to me that the great elevation of temperature which often follows perforation into the peritoneal cavity, coming on as it commonly does at once, should also be attributed more to an intense reflex irritation than to septicæmia. The annexed chart (Fig. 125) is from a case under the care of a colleague in the Philadelphia Hospital in which the placenta was abnormally adherent. Separation was accomplished four hours after delivery by means of the fingers and a curette. Ulceration of a limited area in the placental site followed, which ended in perforation and death on the third day.

FIG. 125.



Rise of Temperature following Perforation of the Uterus.

FEVER IN THE PUERPERAL STATE FROM CEREBRAL DISEASE.

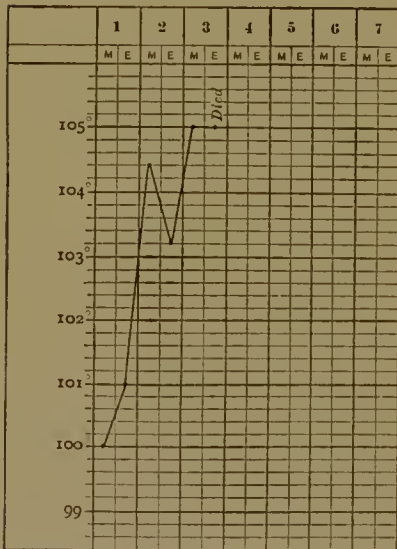
A woman in the puerperal state might have a tumor in brain or spinal cord, insular sclerosis, locomotor ataxia, or

degenerative changes in the brain,—all of which could give rise to elevations of temperature.¹ It is, however, to cerebral hemorrhages and embolism that one should usually look for an explanation of fever arising from brain disease, for these accidents are by no means rare during the lying-in; and if the hemorrhage or embolism affects certain regions, a rise of temperature, often to a great height, is pretty sure to follow. A temperature of 108° in the axilla has been noted in a case of cerebral embolism following childbirth.²

FEVER WITH ECLAMPSIA.

It is difficult to know where to place the fever that accompanies eclampsia. As very little is known about the etiology of the disease itself, so it cannot be expected that the origin of the fever will be explained. With our present know-

FIG. 126.



Fever Chart of Patient who Died of Eclampsia.

ledge it is safe to put it among the non-infectious fevers of the puerperal state. Winckel,³ writing in 1878, said he had observed and had called attention to the fever accompanying eclampsia fifteen years before: he was accordingly the first to refer to it. Bourneville and Budin published this fact as an original discovery in 1872.

With each convulsion there is commonly a notable rise of temperature, until finally the fever may run very high.

INSOLATION.

Sunstroke or heat-stroke is by no means an impossible accident to lying-in women in the torrid temperature of summer in this part of the country. The only case, however, that I know of occurred at sea in a ship sailing from France to New Orleans.⁴ The cabin in which the woman was confined was hot and ill-ventilated. The temperature of the air was 93.4° Fahr. A portion of the membranes was left behind, and the discharge was offensive, but there was no fever. On the fourth

¹ W. Hale White: "The Theory of a Heat-centre, from a Clinical Point of View," *Guy's Hospital Reports*, 1884, p. 49.

² Neve: "A Case of Cerebral Embolism, with Hyperpyrexia, following Childbirth," *Lancet*, 1884, ii. p. 103.

³ *Path. u. Therap. des Wochenbettes*, 3te Aufl., 1878, p. 493.

⁴ Skinner: "Sur un Cas d'Hyperthermie post-puerpérale," *Le Progrès médical*, 1887, p. 269.

day, however, the temperature rose to 104° , and shortly after mounted to 109.4° in the rectum. The woman ultimately recovered, in spite of Liebermeister's declaration that death inevitably follows in man when the temperature rises to 108.5° .

SYPHILITIC FEVER.

Mewis,¹ from an analysis of 167 cases of syphilis in lying-in women, made in 1879, came to the conclusion that the influence of the puerperal state upon the local lesions of the disease was a favorable one, but he called attention to a special tendency in syphilitic women to specific febrile action and to periuterine inflammations during that period. Fournier's discovery of a specific syphilitic fever naturally turned the attention of French writers and students to this matter, and there were four elaborate theses on the subject written in Paris during the years 1885-86. According to Combes,² the idea that syphilitic fever might complicate the puerperal state was first suggested by Pinard to Sacreste, who embodied this notion in a thesis.³ In this article the assertion is made that of 24 puerperal cases in which syphilis existed, 18 presented the specific fever. The fever is described as moderate, innocuous, lasting seven to eight days. These observations were made in such an astonishingly careless manner, however, that they are quite worthless. Mercier⁴ describes 9 cases among syphilitic puerperæ in which there developed fever, irregular, intermittent, or remittent in type, yielding to internal administration of mercury, and not influenced by antiseptic injections. Fauconnier⁵ studied the puerperal state of 36 syphilitic women: in 21 there was no fever; in 7 cases there was an elevation of temperature that could be explained by some complication of the puerperal state; in 8 instances nothing could be found to account for the rise of temperature but the syphilitic condition.

Combes⁶ made a very careful and accurate investigation of the matter. His material for observation consisted of 188 cases in the services of Drs. Porak and Doléris. Of this number the puerperal state was afebrile in 141. There was fever in 47—a proportion of 33 per cent. Of the latter number, 38 could be explained by the commoner complications of the puerperal state; 9 admitted of no definite explanation except the essential fever of syphilis; but in 2 of these cases infection had occurred more than three years before, and they are there-

¹ *Zschr. f. Geburtsh. u. Gynäk.*, Bd. iv. H. 1.

² "Suites des Couches chez les Syphilitiques," *Thèse de Paris*, 1886.

³ *De l'Hyperthermie syphilitique post-partum*, Paris, 1885.

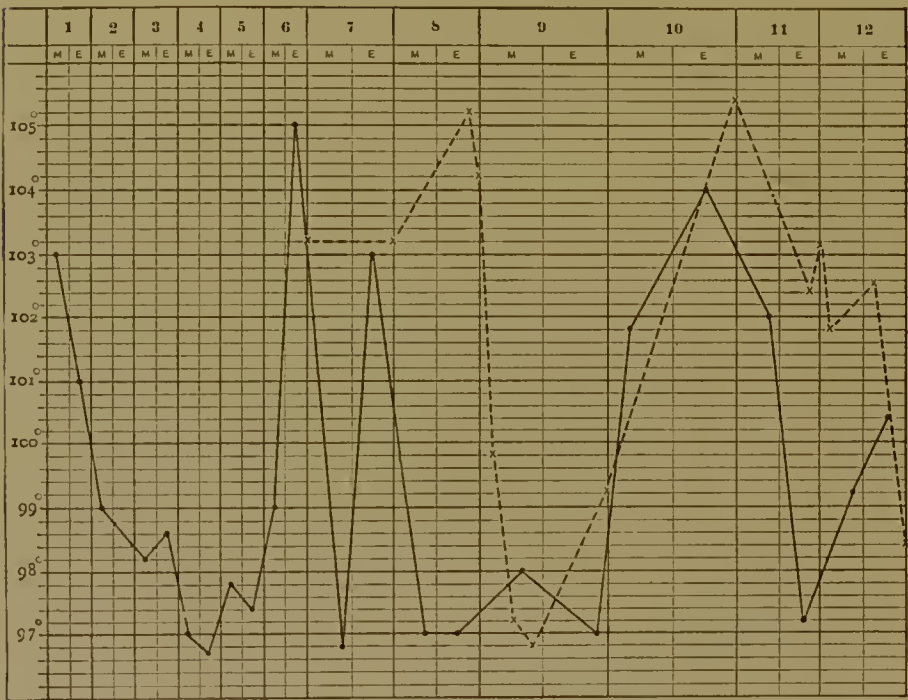
⁴ "Contribution à l'Étude des Rapports de la Puerpéralité et de la Syphilis," *Thèse de Paris*, 1886.

⁵ *De la Fièvre et des Métorrhagies dans les Accouchements syphilitiques*.

⁶ *Loc. cit.*

fore excluded. This leaves 7 cases of fever out of 188 confinements in syphilitic women to be attributed to syphilitic fever, and even this small number should perhaps be diminished by the subtraction of 3 more in which the duration of the disease was unknown, and could have been more than three years. Thus the proportion of syphilitic fever to be looked for in women after childbirth is only a trifle over 2 per cent. of those women affected with the disease. This estimate is probably correct. I have never seen a case myself in the puerperal state, but once witnessed a typical example in a child with hereditary syphilis (Fig. 127). In my own experience with syphilitic women in

FIG. 127.



Temperature Chart of Child with Syphilitic Fever.

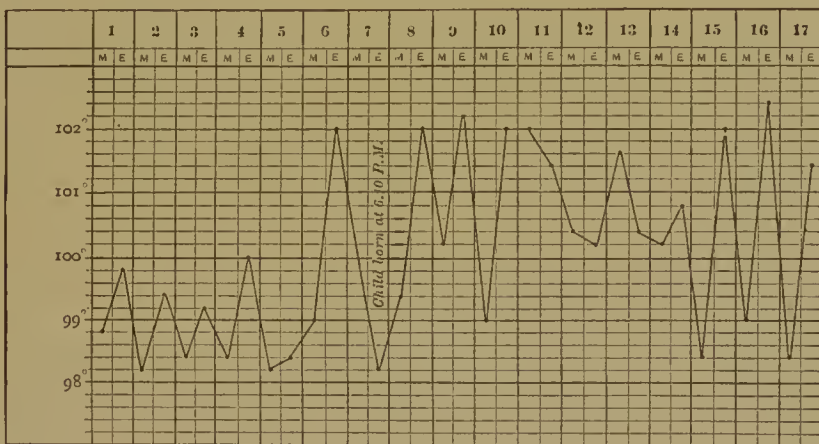
childbed the disease has only interfered with puerperal convalescence in two ways: either by the retention within the uterus of the hypertrophied deciduous membrane,¹ which is so often seen as a result of syphilis, or, as in one instance, by septic infection which occurred in consequence of large ulcerated surfaces in the vagina that had developed during pregnancy.

¹ See Kaltenbach on "Syphilitic Endometritis in Pregnancy and the Puerperal State," *Zeitschr. f. Geburts.*, Bd. ii. p. 225.

PERSISTENCE OR EXACERBATION OF FEBRILE AFFECTIONS IN THE PUERPERAL STATE.

A woman may of course acquire any of the acute or chronic fevers during pregnancy, which may persist in the puerperal state or take on new activity during that period. This is true of all the infectious diseases, but they will not be considered in detail here, with one exception. The effect of labor upon the course of phthisis has interested many observers. It has been asserted that the disease makes no progress, or at least is very much retarded, in the puerperal state. This is certainly not my experience, nor is the belief a reasonable one. Processes that often exhaust a healthy woman could not exert a favorable influence upon a wasting disease. Indeed, we have good authority for the belief that the anæmia of pregnancy, the drain of the puerperal state and period of lactation, are often accountable for the origin of phthisis.¹ In my own cases there has usually been, after delivery, an exacerbation of fever, with an aggravation of the pulmonary symptoms (see Fig. 128).

FIG. 128.



Fever Chart of Woman with Advanced Phthisis in Pregnancy and the Puerperal State.

Occasionally there will occur a rise of temperature in the puerperal state to a considerable height, and yet it will be difficult to discover a cause for the fever.² Our suspicions will naturally first be directed toward septic infection. The wonderful results of antiseptic in obstetric practice, the prominence of puerperal septicæmia as a subject of discussion in medical societies, journal articles, and more pretentious works, have accomplished a splendid purpose in directing men's minds to the constant danger, the ubiquitous nature, of septic poisons. But in one particular the result has been unfortunate. It is often difficult to con-

¹ Austin Flint and Goulard: *Parvin's Obstetrics*, p. 225.

² Fildes: *Boston Med. and Surg. Journal*, 1884, ex. 275.

vince a medical man that fever in the puerperal state can have another origin than sepsis. I have had a personal experience in this direction. On one occasion I called in consultation a medical practitioner to a very critical case of fever in the puerperal state that after careful study I had decided was not of septic nature. My medical friend, after a cursory examination, assured me the case was one of puerperal septicæmia, and that the patient would die. The subsequent course and termination of the case demonstrated his mistake. While it is a good rule to suspect a septic origin for every case of fever after childbirth, it should not be forgotten that there are many other possible causes for an elevation of temperature at a time when derangements of the body-heat are more common than at any other period of adult existence.

ACUTE INTERCURRENT AFFECTIONS IN THE PUERPERAL STATE.

Any of the acute diseases common to the human race may fasten themselves upon a woman after confinement. They acquire a special interest, however, in this condition, for their course is often modified, their termination often more disastrous, and their diagnosis usually more difficult. It is very puzzling, and occasionally impossible, to distinguish certain diseases, as erysipelas, diphtheria, malaria, scarlet fever, and typhoid fever, occurring during the lying-in period, from the commoner forms of septic infection to which women are so liable at this time.

PNEUMONIA.

Pneumonia does not attack women as often as it does men, but it is more fatal in the former. Pregnancy and the puerperal state are to be regarded as grave complications of the disease, for they increase the gravity of the symptoms and should make the prognosis distinctly less favorable than under ordinary circumstances. Pneumonia more frequently attacks a woman during the nine months of pregnancy than during the two weeks of the puerperal state, obviously because the period in the former case is a longer one. But the pneumonia of pregnancy often becomes a complication of the puerperal state, for frequently the disease induces a premature expulsion of the ovum at the height of the attack, and convalescence or death occurs in the lying-in period. In 43 cases of pneumonia in pregnancy collected by Rieau¹ there was premature expulsion of the fœtus in 21. From these statistics it further appears that the likelihood of this accident is increased after the sixth month. In 28 of the 43 observations the women had not passed the sixth month of pregnancy; of this number, 11 aborted. Of the other cases, however, 15 in number,

¹ *Thèse de Paris*, 1874.

in which the pregnancy was past six months, there was premature labor in 10 instances.

The PROGNOSIS of pneumonia in pregnant women is grave. Of Ricau's 43 cases, 12 died; 5 of the deaths fell among the 28 women not yet six months pregnant; 7 were distributed among the 15 who had advanced beyond this time. The infants were expelled in 21 cases prematurely; some of them were not at a viable age, but even of those which had reached sufficient development to exist without the uterus the majority died. Tarnier¹ sums up the outlook for mother and child in the following way: The more advanced the pregnancy, the greater the probability of an expulsion of the fœtus, the graver the prognosis for mother and child.

TREATMENT.—A discussion of the medical treatment of pneumonia has no place here. A consideration of the obstetrical treatment of the disease when it attacks the pregnant woman is of great practical importance, and is best handled by an obstetrician. The question that will come before him for decision will be to induce labor or to avoid interference. Pregnancy complicates pneumonia by mechanically increasing the difficulty of respiration, by calling upon the heart for extra work, and by demanding unusual facilities for disposing of the waste products of two organisms, part of which should be discharged through the lungs. It would seem, therefore, that the uterine cavity should be emptied for the mother's sake, more especially as the infant deserves but small consideration, being almost certainly doomed. But the evacuation of the uterus, the contraction of its walls, and great diminution of its blood-supply favor a determination of blood to other internal organs, among them the lungs. The exhausting discharges of the puerperal state, moreover, may fatally waste the patient's strength, while in her feeble and unresisting condition it would seem possible at least to have a general septic infection added to the pulmonary disease. Statistics certainly do not speak in favor of artificially inducing abortion or premature labor. Matton² says that of 18 cases in which pregnancy was interrupted, 9 women died, while in 20 women who suffered from pneumonia without aborting but 1 succumbed. Tarnier justly remarks that in the former series the disease was probably more malignant, and that this fact accounted for the abortions as well as for the fatal issue in such a large proportion; and of the 20 cases it was perhaps on account of a mild attack of the disease that none aborted and but 1 died. There are, however, 2 recorded cases in which death occurred without the previous interruption of pregnancy. Chatelain's³ statistics include 39

¹ Tarnier et Budin: *Traité de l'Art des Accouchements*, t. ii., Paris, 1886.

² *Journ. de Méd. de Bruxelles*, 1872, p. 412.

³ *Ibid.*, 1870, t. i. pp. 430, 516, and t. li. p. 11.

cases; in 10 abortion occurred; in 9 premature labor was induced. Of the 19, 10 died, and of the remaining 20, 10 also died, showing that little was gained by the interruption of pregnancy. It must be remembered, too, that it requires considerable time and also a certain amount of operative interference to induce abortion or premature labor, and during the process the woman may die. On the other hand, it is an undoubted fact that, temporarily at least, the symptoms are often somewhat relieved after the expulsion of the uterine contents. It would perhaps be well to consider the advisability of emptying the uterus in cases where the pregnant organ was obviously a great mechanical hindrance to the expansion of the undiseased lung-space.

During the past year there have been 5 cases of pneumonia in the obstetrical wards of the Philadelphia Hospital. As the disease among pregnant and puerperal women is a rare one, and the cases in themselves were interesting, I feel warranted in giving a short sketch of them:

CASE I.—Mary C——, X.-para, in the sixth month of pregnancy, was in the hospital awaiting confinement. She was seized one night with a violent chill, and soon developed symptoms of pneumonia in the right lung. On the third day of the disease the fœtus was expelled; it lived for five hours. At the beginning of labor the temperature stood at 103.8° Fahr.; directly after the expulsion of the child it was found to be 101.4° , but rose steadily again for two days, until the woman died, on the fifth day of the disease. The post-mortem examination showed pneumonia of the whole right lung, with "bread-and-butter" pleurisy on the same side.

CASE II.—Anne McG—— was brought into the hospital on an ambulance. She had been taken sick six days before, but had been neglected. A physical examination revealed pneumonia in a woman seven months pregnant. Half an hour after arrival in the hospital she gave birth to her infant, which only lived three hours. The woman's temperature one hour after labor was 100.4° Fahr.; it rapidly rose, however, to 103.8° , and remained high till her death, on the eleventh day of the disease.

CASE III.—Anne O'B——, I.-para, had been quite well during the whole of pregnancy. The labor, at full term, was so precipitate that no examination was made; the woman scarcely had time to lie upon the bed before the baby was born; the placenta was expressed without difficulty. On the third day of the puerperium pneumonia of the left lung developed, and shortly after pericardial friction-sounds were heard. Death occurred on the fifth day of the disease. The post-mortem examination, which I made myself with great care, showed pneumonia, pleurisy, and pericarditis. The external genitalia, the

uterus, and broad ligaments, the peritonæum, and the rectum, were quite normal.

CASE IV.—Ida M——. Within two weeks of term the woman was attacked by pneumonia. The child was born on the third day of the disease, was cyanotic from the first, and died in a few hours, convulsed. When labor began the temperature was 101° ; one hour after the child was expelled it had sunk to 98.2° , but immediately rose again. After an illness of about five weeks the patient recovered.

CASE V.—Mary G——. Pneumonia developed on the second day of the puerperal state; all the symptoms and physical signs were typical. The disease lasted for eleven days and ended in recovery.

Of the 3 women attacked during pregnancy, all expelled their infants prematurely, 2 died, and 1 recovered. Of the 2 women who acquired the disease after labor, 1 died and 1 recovered. Of the 3 infants born in the midst of the disease, all died. The cause of death in the newborn lay apparently in a diseased condition of their lungs. In all the cases these organs were intensely congested; in 1 the lungs sank in water; in the other 2 they were not so buoyant as healthy lung-tissue should be. In only 1 case, unfortunately, was a microscopic examination made. In that there was interstitial pneumonia, evidently syphilitic. Culture-tests were made from this lung with negative results.

Three of these cases illustrate the effect of labor upon a febrile temperature. The muscular effort, the pain, and interference with respiration during labor seem to induce a condition resembling surgical shock: the patient is exhausted, the pulse is weak and rapid, the temperature is lowered, and the body bathed in sweat. The most remarkable example of this I ever saw was in a woman suffering from typhoid fever during pregnancy. The disease induced a premature expulsion of the fœtus at seven months. When labor-pains began the temperature was 104.4° Fahr.; directly after the expulsion of the infant it was only 96.8° ; for the next twelve hours it remained below normal, going at one time to 95° . At the expiration of twelve hours the body-heat again began to rise in consequence of stimulation and external heat; the temperature shortly reached 100.4° Fahr., then went up to 104° . Labor came on during the twenty-first day of the disease; the patient recovered after an illness of five weeks. There was no hemorrhage from the genitalia nor into the intestines to account for the fall of temperature.

PLEURISY

may possibly complicate the puerperal state. It would be simply an intercurrent affection, to be treated on general principles.

THE EXANTHEMATA.

SCARLET FEVER.

Although this disease in the puerperal state has been the subject of much attention and discussion among medical writers, there are even yet several points in its relationship with childbed in dispute. It is not strange that there should be some confusion and difference of opinion among those who have recorded their observations of the disease among puerperal women, for its course is often much modified by the woman's condition: it may be complicated by the coexistence of some other variety of septic infection; there may be, on the other hand, scarlatiniform rashes in the course of septicæmia, although the specific poison of scarlatina may be quite excluded; and, moreover, there may be in certain cases, after infection with the poison of scarlatina, a train of symptoms undistinguishable from that which commonly follows the entrance into the body of putrefactive or pus-producing micro-organisms.

FREQUENCY.—Scarlet fever is certainly not a common complication of the puerperal state. Prior to 1876, Olshausen¹ collected 134 cases; Winckel² saw 1 in Rostock; single cases are likewise reported by Palmer,³ Parvin,⁴ Busby,⁵ Harvey,⁶ and Cummins.⁷ Braxton Hicks⁸ asserts that he has met with 37 cases, chiefly in consulting practice. Epidemics of scarlet fever among puerperæ are described by Boxall⁹ and Meyer,¹⁰ in which respectively 16 and 18 women were attacked by the disease. In the discussion on Boxall's paper several members of the Obstetrical Society related individual experiences with the disease. It cannot be asserted that puerperæ are peculiarly predisposed to scarlet fever. Epidemics occur, it is true, in lying-in hospitals at long intervals, but the proportion of patients attacked is never very large. During the epidemic in the Maternity Hospital of Copenhagen, described by Meyer, only about 1 per cent. of the lying-in patients acquired the disease. Boxall says that 40 women were exposed to the contagion of scarlet fever during the continuance of the epidemic, without the slightest detriment to their health. During the years 1871–85 there were only 2 cases of scarlet fever in the lying-in period among the patients at the Copenhagen Maternity; in six years but 3 cases of the kind were seen in the Hospital for Infectious Diseases (Meyer).

¹ *Arch. f. Gynäk.*, Bd. ix. S. 169.

² *Path. u. Therap. des Wochenbettes*, 1878, p. 529.

³ *Cincinnati Lancet Clinic*, 1887, p. 481.

⁴ *Am. Journ. Med. Sci.*, 1884, 88, 179.

⁵ *Ibid.*, 1887, p. 394.

⁶ "Scarlet Fever and the Puerperal State," *N. Y. Med. Record*, 1886, xxx. 376.

⁷ *Br. Med. Journ.*, 1884, i. 760.

⁸ *Lond. Obst. Tr.*, vol. xii. pp. 44–113.

⁹ Abstr. from *Lond. Obst. Tr.* in *Am. Journ. of Obstet.*, 1888, pp. 547, 553, 666.

¹⁰ "Ueber Scharlach bei Wöchnerinnen," *Zeitschr. f. Geburtsh.*, Bd. xiv. S. 289.

INFECTION AND PERIOD OF INCUBATION.—Women after childbirth may be infected with the poison of scarlet fever in the ordinary manner through the throat or through the wounds in the genitalia. The latter statement has been disputed, but the short period of incubation, the fact that the rash begins often at the vulva and spreads thence over the trunk, the common occurrence of pelvic inflammations, and the fact that the diphtheritic patches usually seen in the throat of scarlet-fever patients are met with commonly in the vagina when the disease attacks a lying-in woman, while the throat is affected to a minor degree or entirely spared,—all indicate the genitalia as the point of entrance for the specific *materies morbi*. It is likely that the majority of women affected during the puerperium are infected by actual contact with the disease-germs on fingers or instruments inserted in the vagina; but it is quite possible that the poison of the disease may be drawn into the throat from the atmosphere or may be conveyed to the genitalia by the same medium. Before the adoption of antiseptic measures in surgical practice it was well understood that the poison of scarlet fever might find entrance to the body through a solution of continuity in the skin and mucous membranes. Sir James Paget long ago pointed out that the wounded become more susceptible to scarlatina.¹ The woman after childbirth is always a wounded person, and she also becomes more susceptible to attacks of the disease. This explains those cases which, exposed to the contagion during pregnancy, only manifest the symptoms of the disease after labor, the poison having lain dormant for varying lengths of time till its invasion of the body is facilitated by the wounds and abrasions which are always consequent upon parturition (Olshausen). This mode of entrance would also explain the short period of incubation when scarlet fever attacks a puerpera. Ordinarily, five to seven days intervene between the date of infection and the appearance of the first general symptoms. In the puerperal state, however, the time of incubation is shortened to twenty-four or forty-eight hours (Seenn, Hervieux, Olshausen).²

Olshausen says that four-fifths of all puerperæ attacked will manifest the first symptoms at some time in the first three days after labor; and this assertion has been supported by the majority of the cases reported since the appearance of his article.

SYMPTOMS AND DIAGNOSIS.—A frank case of scarlet fever in the puerperal state should present no greater difficulty in diagnosis than the disease would offer under any other circumstances in the adult male or female. But it is asserted "that in rare instances the disease may assume a masked form, in which the ordinary signs of scarlatina are absent, or so slight and evanescent as to escape observation, and that in some such cases the only manifestation of the illness may be found

¹ See also Hoffa: *Vollmann's Samml. klin. Vorträge*, No. 292.

² *Loc. cit.*

in signs usually referred to septic poisoning" (Boxall).¹ It is, moreover, a well-recognized fact that one of the manifestations or accompaniments of septicæmia in occasional cases is the appearance of a scarlatiniform rash. And, again, there are reported from time to time erythematous eruptions in the puerperal state resembling, on the one hand, the rash of scarlet fever, and, on the other, the eruption sometimes associated with general sepsis,² and yet apparently unconnected with either of these diseases. Finally, there may coexist in the same individual local inflammations about the pelvic organs of septic origin and a general infection of the whole organism with the poison of scarlet fever. It is obvious, therefore, that a definite diagnosis of scarlet fever in the puerperal state may be difficult or even impossible. The diffuse nature of the rash, followed by desquamation; the characteristic appearance of the tongue; the affection of the throat; the more exaggerated diphtheroid inflammation of the vagina; the exposure to the contagion of the disease; the occurrence of scarlatinous nephritis; finally, the infection of those who come in contact with the patient, and the subsequent outbreak in them of a typical case of the disease,³—may serve to clear up a doubtful case. But there must remain cases in which the existence of this disease, with symptoms closely resembling sepsis, will be overlooked, or if suspected can only be inferred. Holding this view, it follows that I must differ from the author of the preceding section as regards the scope of the term "puerperal infection." To my mind, it should signify the entrance into the organism through the wounds along the genital tract of any one of the large number of pathogenic micro-organisms or their products capable of causing local inflammations or producing symptoms of general disease.

THE PECULIARITIES OF SCARLET FEVER IN THE PUERPERAL STATE.—Olshausen asserts that scarlet fever is modified in three ways when the disease appears during the puerperium: it almost always appears in the first three days after labor; the throat complications are slight; the eruption appears quickly, is rapidly diffused over the body, and is apt to assume a dark-red color. Winckel states that convalescence is commonly tedious. A careful study of the published cases must convince any one that scarlet fever exercises an unfavorable influence upon the puerperal state. The milk secretion is often lessened, if

¹ Braxton-Hicks takes an extreme position in this connection. He says that among 68 cases of puerperal disease in his practice for which there was a demonstrable cause, 37 were due to scarlet fever. This is no doubt an over-estimate, and it has not met with general acceptance. Even Boxall's moderate statement, however, has a long list of names arrayed in opposition to it, but to the writer's mind the weight of evidence is distinctly in favor of his view.

² This word is used, in default of a better, to designate infection by the commoner pyogenic micro-organisms.

³ See the cases reported by Palmer and Harvey, *loc. cit.*

not suppressed ; there is commonly some change in the lochia, denoting probably an exanthematous endometritis or a diphtheritic inflammation of the vagina. In a number of the cases reported fetid lochia is noted ; in some a "peculiar odor" is described ; the only change noticed may be an increase or a return of the lochia cruenta. In a considerable proportion of all the cases it would appear that the discharges from the genitalia were unaffected. In 10 of the cases reported by Meyer rheumatic complications were encountered. In 21 of the cases collected by Olshausen there was an evanescent tenderness over the uterus. The occurrence of pelvic inflammation is reported in such a large proportion of the entire number of cases that one is forced to believe there must be something more than a coincidence to account for it. Of Meyer's cases, for instance, 6 presented evidence of peri- and parametritis. It is possible that the specific poison of scarlet fever is capable of causing a pelvic peritonitis when it enters the body through the wounds along the genital tract or finds entrance to the peritoneal cavity through the tubes. Or perhaps there may be a "mixed infection," as happens in gonorrhœa. Whatever the explanation, it would appear highly probable that pelvic inflammation can occur as a consequence of scarlatinous infection during or after labor. Diarrhœa may develop early in the attack. It would seem to be an unfavorable sign. Of 21 women in Olshausen's series thus affected, 15 died.

PROGNOSIS.—If the attack is a frank one, the genitalia not much involved, nor the pelvic tissues inflamed, the issue will probably be favorable. It would scarcely be correct, however, to assert that the prognosis of scarlet fever in the puerperal state is favorable. The death-rate among Olshausen's cases was 48 per cent. ; of those infected immediately after labor, 75 per cent. Of Meyer's 18 cases, 1 died. In 3 cases observed by Martin all died. Of Braxton Hicks' 37 patients, 27 died. Some of these, however, were probably of ordinary septic origin. Galabin¹ twice saw fatal peritonitis during desquamation. On the other hand, Hervieux had 7 cases which ended favorably. All of Boxall's cases recovered. Legendre² reports 23 cases without a death. The single examples reported by Palmer Parvin, Busey, Harvey, and Cummins all ended in recovery.

ERYTHEMATOUS RASHES IN THE PUERPERAL STATE.

A rash will sometimes make its appearance on the skin of a puerpera somewhat resembling the exanthem of scarlet fever, but a distinction can usually be made between the two. In the simple erythema there is apt to be a moderate and evanescent fever,³ the pulse is rapid,

¹ Discussion on Boxall's paper, *loc. cit.*

² See Parvin, *loc. cit.*

³ Mackness: "Some Scarlatinous Rashes occurring during the Puerperium," *Edinb. Med. Journ.*, August, 1888.

and in most cases fetid lochia is noted¹ with some uterine or pelvic tenderness; miliaria often make their appearance, especially on the abdomen under the binder, and there may be desquamation. The eruption is very likely the expression of a septic infection, usually of a mild degree; but occasionally erythema may be associated with the gravest forms of septicæmia. Mackness explains the eruption by the supposition that some septic products are evacuated through the sweat-glands, irritating the skin and producing a general hyperæmia. His theory is supported by the fact that the rash is at first punctate, seeming to begin usually at the hair-bulbs, and soon after becoming diffuse. The belief in the septic nature of the eruption is shared by Winckel, Kaposi, Maygrier, Gencix, Farre, and many others. The superficial resemblance that this affection bears to scarlet fever has led many observers into what the majority of the obstetrical world must deem an error. Perhaps some of Hicks' cases should be classed under this head. Raymond² would have one believe that this eruption is the manifestation of an attenuated form of scarlet fever. With some such idea in mind also Gueniot calls the rash scarlatinoid. It is likely that future investigation will confirm an opinion, already expressed, that there is an "infectious erythema" dependent upon the invasion of the body by a specific microbe, which, it is claimed, has been already isolated.³

MEASLES.

Pregnant women are rarely attacked by measles. The disease is even more rare in the puerperal state, owing to the shorter duration of the period. The measles of pregnancy, however, usually becomes a complication of the puerperium by inducing the expulsion of the ovum. 9 out of 11 cases of measles during pregnancy reported by Klotz⁴ caused a premature expulsion of the fœtus. Occasionally the disease will first manifest itself in the puerperal state. Tarnier⁵ describes an instance in his own experience. All writers who have touched upon measles in the childbearing woman agree that it is a dangerous disease. There is a disposition to hemorrhagic accidents, and pneumonia is a frequent and a very dangerous complication. Two

¹ Mackness, *loc. cit.*; MacDonald, *Edinb. Obst. Soc. Tr.*, 1884-85, x, 235; Charpentier; Guéniot, *Thèse*, 1862; Poupon, "Erythème scarlatiniform chez une Femme récemment accouchée," *La France médicale*, 1884, i, 41.

² *Thèse d'Aggrégation*.

³ Simon et Légrain: "Contribution à l'Étude de l'Érythème infectieux," *Ann. de Dermatol. et de Syphillog.*, November, 1888.

⁴ *Arch. f. Gynäk.*, Bd. xxix. S. 448.

⁵ Tarnier et Budin: *Path. de la Grossesse*, p. 17. A good bibliography precedes the chapter.

fatal cases of measles during the puerperium have been reported recently in this country.¹

SMALLPOX.

The condition of pregnancy and the puerperium should make the prognosis of all the eruptive fevers more grave. This is true of smallpox as of the rest. Luckily, the disease is a rare one under any circumstances in this country, and as a complication of the puerperal state it is of very exceptional occurrence.

A case of r  theln² during the puerperal state has recently been reported. Any one of the eruptive fevers, of course, might constitute an accidental complication in the puerperium.

PUERPERAL ERYSIPELAS.

There is no other disease of the puerperium about which there has been such a lively discussion in regard to its relationship with puerperal sepsis. I have therefore left a consideration of the connection between the infectious diseases and puerperal sepsis to be taken up under this heading. There is a degree of confusion still surrounding this matter which, in the light of modern investigation and discovery, is surprising. Not only is this an unsatisfactory condition from a scientific point of view, but I believe that the obscurity which still invests the subject of puerperal sepsis in its relation to the poisons of infectious diseases is productive of real harm in preventing an appreciation of sources of infection which are too apt to be overlooked. Much can be done, I think, to clear away the confusion still surrounding the whole subject of the etiology of puerperal fever by discarding certain old terms until recently in pretty general use, or else by so limiting their meaning as to make them definite expressions. With this idea in mind I venture to present a classification of the febrile diseases in the puerperal state, with the hope that by so doing something may be gained toward the attainment of a definite conclusion in regard to a matter which is not excelled in importance by any other in the whole domain of obstetrics. Briefly this classification is as follows:

The phrase "puerperal fever," I think, should be taken, in its literal sense, to mean an elevation of temperature during the period of uterine involution. With this signification the term is a general one, and needs further classification and analysis. A broad division of all fevers in the puerperal state might be thus made:

- I. Non-infectious;
- II. Infectious.

The infectious fevers may again be further classified as follows:

¹ Hulburt: *St. Louis Courier of Medicine*, 1887, 17, p. 549.

² Kite: *Boston Med. and Surg. Journ.*, August 18, 1887.

A. Those in which the infecting poison enters the system through wounds along the genital canal;

B. Those in which the infecting poison enters the system by other channels.

It is convenient to divide the infectious fevers in which the infecting poison enters the system through wounds in the genital tract into—

1. Those in which the microbes, prime cause of the evil, themselves enter the organism;

2. Those in which only the products of microbial activity, the ptomaines, are absorbed.

The one point about which greatest confusion reigns is in regard to the number of microbes, classed under subdivision 1, which can enter the system through wounds along the genital tract, causing local inflammations and general manifestations of disease. I think the mistake now-a-days most frequently made is in using the words "puerperal septicaemia" as a satisfactory substitute for the phrase "puerperal fever," forgetting that septicaemia is scarcely a more definite term than the simple word "fever"—that it is almost as generic in its signification, and includes within itself a large number of specific diseases. Dr. Ernst in his section points out clearly how many kinds of micro-organisms are capable, when introduced into the body through a wound, of producing a train of symptoms pretty much the same, characterized by local inflammation and suppuration, as well as by other symptoms of general body-infection. Here I think it is that the confusion surrounding this subject in the minds of gentlemen who are purely obstetricians, without much knowledge of bacteriology, can do so much harm. If one accepts the doctrine which has been quite recently advanced, that puerperal septicaemia is produced by but a single kind of streptococcus, and that such diseases as erysipelas and scarlet fever must be always regarded as intercurrent affections without connection with puerperal sepsis, he might easily neglect adequate precautions to prevent infection by the micro-organisms of these diseases; whereas these microbes, introduced into wounds along the genital canal, are sometimes instrumental in occasioning the most virulent kinds of septic fever after labor, perhaps without any of those symptoms which, under ordinary circumstances, are characteristic of the diseases in question. There is now indubitable proof to support this assertion in the case of erysipelas. It can be clearly shown that the poison of the disease when introduced into wounds along the genital canal is capable of generating a violent form of puerperal sepsis without manifesting externally that rash which is commonly supposed to be distinctive of erysipelas. It is true that this doctrine has opponents, chief among whom is Gusserow.¹ In the

¹ "Erysipelas und Puerperal fieber," *Arch. f. Gynäk.*, Bd. xxv., 1885, p. 169.

spring of 1879, during an epidemic of septic trouble after labor, there appeared also an outbreak of erysipelas in the wards of the Charité. From a study of this epidemic Gusserow reached the conclusion that there was no connection between the poison of erysipelas and the poisons capable of originating puerperal septicaemia. The apparently preconceived opinion of this observer found support in experiments that he made upon animals with the streptococcus of Fehleisen. He was unable to infect animals by inoculating the microbes in the peritoneal cavity, and even, in some instances, through a wound penetrating the peritoneum into the subperitoneal connective tissue. These experiments, however, proved nothing. They can be met by conflicting observations of Winekel, to which reference will shortly be made. Indeed, no one, I think, could read Gusserow's report of the combined epidemics of puerperal fever and puerperal erysipelas without suspecting that the majority of cases were really erysipelatos, while in only a small proportion did the disease manifest itself by a subcutaneous inflammation and by the consequent appearance of a rash. There is nothing proved, moreover, by cases reported from time to time in which exposure to the poison of erysipelas during childbed did not result in puerperal fever. This kind of evidence simply shows that some women after childbirth are better able to resist infection than others. The verdict in regard to the connection between the poison of erysipelas and the poisons of puerperal sepsis must rest upon positive and not upon negative evidence. In this connection the experience of obstetricians who have been placed in a situation to observe clinically the connection between puerperal infection and erysipelas must count for much. Goodell¹ has said, "that there is a relation between the diseases I am satisfied." This assertion is based mainly upon an experience with three cases of violent puerperal peritonitis which were, in all likelihood, of erysipelatos origin. The child of one woman broke out in an erysipelatos rash. The nurse in attendance upon the other two also contracted erysipelas. Dr. Goodell in the course of his remarks quoted the case of a physician who while in attendance upon an erysipelatos patient delivered seven women. Five of them died of puerperal fever without showing external evidence of the disease in a rash. Dr. Fordyce Barker² on the same occasion said: "The intimate relation between puerperal fever and erysipelas I consider as firmly established as is any fact in medicine." He referred to the epidemic of black tongue in Connecticut which he witnessed in the early part of his professional career, and stated that every woman who was confined at that time in the region devastated by the epidemic had puer-

¹ Discussion on Dr. Campbell's paper, "Erysipelas in Childbed without Puerperal Peritonitis," *Tr. Am. Gynec. Soc.*, vol. vi., 1881.

² *Ibid.*

peral fever, without respect to who was the accoucheur; and he thought every one of these women died. Dr. Barker also spoke of a physician who contracted a fatal case of erysipelas from a patient whom he attended in puerperal fever. Statistics recently gathered in Belgium show plainly the connection between outbreaks of puerperal fever and of erysipelas in certain districts.¹ In an analysis of the Belgium health reports it was found that the number of localities where erysipelas and puerperal affections were noted at the same time numbered 456, while there were only 154 districts in which puerperal affections were observed alone without accompanying outbreaks of erysipelas. In discussing Dr. Boxall's paper on "Scarlet Fever in the Puerperal State,"² Dr. Playfair said: "Twenty-five years ago a lying-in ward was established in King's College Hospital. The arrangement was disastrous, and was at length abandoned. During the existence of the ward there were outbreaks of erysipelas in the surgical quarter of the hospital and coincident epidemics of puerperal fever in that ward, but the lying-in patients had no symptoms of erysipelas; which, on the other hand, was seen in some of their infants." A large number of cases might be cited in which contact with puerperal-fever patients originated an attack of erysipelas, or, on the other hand, in which puerperæ exposed to the contagion of erysipelas developed virulent forms of puerperal sepsis. But the following were so thoroughly studied and are so convincing that they will suffice: In January, 1886, there was admitted to the Frauen Klinik of Munich a puerpera who had been delivered in the city. Behind the right trochanter over the region of the right ischiatic foramen there was a fluctuating surface the size of a hen's egg, which evidently had some connection with a right-sided parametritis exudate. A large hypodermic needle, carefully sterilized, was plunged into the fluctuating tumor and some of its contents withdrawn. In the pus thus obtained Fehleisen's chain-micrococcus was discovered. Pure cultures were made of it, and erysipelas produced with it in a rabbit's ear.³ Another case from the same institution shows how the poison of erysipelas may, after its invasion of the body through wounds of the genital canal, pervade almost all the structures of the organism. A patient who presented at the same time erysipelas of the nates, ulcers of the vulva, metrolymphangitis, and diffuse peritonitis, died on the thirteenth day of her disease. In the blood taken from the heart were found Fehleisen's cocci. The same organisms were discovered in the peritonic and pleuritic exudates, in the kidneys, the liver, the spleen, and in the connective tissue of the heart-

¹ "L'Érysipèle et les Femmes en Couches," Jorissenne, *Arch. de Toccol.*, xv., 1888, p. 302.

² *Tr. Lond. Obst. Soc.*, 1888.

³ Winckel: "Ueber das puerperale Erysipel," Separat-abdruck aus dem *Aerztlichen Intelligenz-Blatt*, München, 1885.

muscle; in the lungs they were found in enormous numbers distributed through the interstitial connective tissue, and in the thrombi within the blood-vessels. This throws some light upon the frequency of pneumonia as a complication of puerperal erysipelas. During an epidemic that Winckel observed in 1880, 6 out of 13 puerperæ attacked manifested this complication. The nature of the micro-organisms was demonstrated by culture and inoculation experiments. With the exception of mice, it was found that lower animals were not very sensitive to the poison of erysipelas. There were, however, nearly always slight symptoms of infection after the inoculation. In three instances of intraperitoneal infection in rabbits the result was negative; in a fourth, suppurative peritonitis followed. It is little wonder, after such experience, that Winckel¹ reasserts with confidence the statement made some time before, that erysipelas occurs in decided relationship and close connection with puerperal sepsis. It is this aspect of erysipelas, as well as of all other infectious diseases, that is particularly interesting to the obstetrician. If these diseases fasten themselves upon the woman after childbirth in the ordinary manner—that is, erysipelas through a scratch in the skin, scarlet fever from the throat or lungs, and so on—their course, symptoms, and treatment differ very little from the ordinary manifestations and management of the respective diseases in an adult female; but when any of these poisons enter the woman's system through wounds along the genital canal, the history is a very different one. The train of symptoms produced is, to a very great extent, the same, no matter what the nature of the poison which has found entrance to the body. There may be the same endometritis, the same involvement of the uterine walls, of the lymphatics, of the connective tissue, and of the serous membranes after infection by any one of the long number of micro-organisms which Dr. Ernst presents in his tables. It is on this point that there is so much difference of opinion, so much confusion in regard to puerperal infection. This confusion can be cleared away, I believe, by the acceptance of the doctrine that the poisons of infectious diseases produce radically different results as they find entrance to the body in their accustomed manner or through wounds in the genitalia. With the course, the symptoms, and the treatment of an ordinary case of erysipelas in the childbearing woman we have little to do. These differ in no respect from the manifestations of the disease under any circumstances. If the disease originates in the genitalia, we have a condition calling for the most energetic treatment to combat the puerperal infection. This latter kind of erysipelas is much the most common after labor. Winckel has seen, in all 42 cases of erysipelas during the pregnancy and the puerperal state:

¹ "Zur Lehre von dem internen puerperalen Erysipel," *Verhandl. der deutsch. Gesellsch. für Gynäk.*, vol. i., 1886, p. 78.

36 of these developed after the delivery of the infant, 6 occurred during pregnancy. Of the cases in pregnant women, not one had its origin in the genitalia. Of the 36 cases in the puerperal state, 28 began in the genitalia, 2 in the breast, and the remainder in the face and scalp. Winckel, from an extensive study of the subject, offers the following points of evidence as to the etiology of erysipelas in the puerperal state and its connection with puerperal sepsis:

1. By far the most frequent points of origin—in five-sevenths of all the cases—for puerperal erysipelas are the genitalia and nates. There are endemics in which not a single case of facial erysipelas appears.

2. Primiparæ contract the disease three to four times as frequently as multiparæ.

3. Puerperæ with wounds upon the genitalia are particularly predisposed to the disease.

4. Those who have undergone difficult operative deliveries acquire the disease much more frequently than others.

5. The children of lying-in women with erysipelas remain in my (Winckel's) experience, free from the disease. (Gusserow in 14 cases saw the child infected twice; in Goodell's experience this happened once.)

6. The larger the number of women diseased in a puerperal-fever epidemic, the larger is also the number of erysipelatos cases.

FREQUENCY.—Erysipelas in the puerperal state manifested by a cutaneous eruption, is not a very frequent disease, but there is no doubt that a large number of cases of puerperal infection might be traced to this poison in which there is no external sign at all of the disease. To the erysipelas of childbed without external manifestation, Winckel appropriately gives the name of internal puerperal erysipelas. With our present knowledge it is impossible to give a correct estimate of the frequency with which erysipelas occurs in the puerperal state. It is equally impossible to state the relationship as regards frequency between the micrococcus of erysipelas and other pathogenic micro-organisms which are capable of producing puerperal sepsis. The writer's conviction is that the poison of erysipelas should be given a very prominent place in the list of microbes capable of producing puerperal fever.

SYMPTOMS AND DIAGNOSIS.—If the erysipelas manifests its existence by a cutaneous eruption, the symptoms are distinctive and the diagnosis is plain. If, on the contrary, the poison expends its strength upon internal organs and tissues, it may be impossible to differentiate this disease from a case of septicæmia due to the invasion of the body by the other germs of putrefaction or of pus-formation. The diagnosis can only be made if the opportunity is presented, as it was in Winckel's cases, of carefully investigating either the blood of the patient, the con-

nective tissue of the organs, or the contents of abscesses which may form in various parts of the body.

PROGNOSIS.—If the case is one of frank erysipelas, starting from the breast or the face, the prognosis is relatively favorable. Among 14 cases of the kind described by Winckel, there were only 2 deaths. Of the 28 cases in which the erysipelas originated about the vulva, 12 ended fatally.¹

TREATMENT.—If there are signs about rents or abrasions in the vagina or on the vulva denoting erysipelatos or diphtheritic infection, the unhealthy wounds should be cauterized. Ichthyol has been proven a valuable means of retarding the spread of the subcutaneous inflammation. This might be particularly useful to limit the extension of the disease should it progress from other portions of the body toward the genitalia. If the case is one of internal erysipelas, the treatment must be the same as that adopted in any grave case of puerperal sepsis; it might be well to test the efficacy of large doses of a tincture of the chloride of iron, which certainly exerts a beneficial action upon the disease under other circumstances.

PUERPERAL DIPHTHERIA.

What has been said of erysipelas applies as well to diphtheria. If infection occurs in the throat, the disease is an accidental complication of the puerperal state. If the infection has occurred in the genitalia, a variety of puerperal sepsis ensues that is considered in another place.

PUERPERAL MALARIA.

Malaria is something more than an acute intercurrent affection of the puerperal state, for in some important particulars the condition of the woman's organism after labor modifies the disease. The liability to infection is increased after childbirth. This is a proposition which is now beyond dispute. It has long been recognized, and will be verified by the experience of every observant physician. Bonfils² in a thesis has collected 140 observations of malarial fever in childbearing women, and carefully studied the articles on this subject written by Pitre Aubinais, Duboné, Ritter, Dupuy, Bureau, Göth, Pasquali, Bonipiani, Cuzzi, and Mangiagalli. As the result of his investigation, Bon-

¹ It goes without saying that the puerperal state predisposes to attacks of erysipelas by furnishing so many points of entrance for the poison in the wounds of various degrees along the genital canal. It would seem also that the condition of the whole organism favored the occurrence of the disease. Döderlein (*Münch. med. Wochenschr.*, 25, 1888) tells of a case in which the poison lay latent for a year in a lymphatic gland, and broke out into fresh activity after an abortion.

² "Paludisme et Puerpéralité," *Ann. de Gynéc.*, 1886, xxvi. 125.

files came to the following conclusions in regard to the influence of malaria upon the puerperal state and to the modifications exhibited by the disease in this condition: Malarial fever after childbirth predisposes to puerperal hemorrhages. These occur apparently in consequence of the disturbances in blood-pressure which accompany the chills and fever. The lacteal secretion is suppressed during the exacerbation of fever, but appears again after the febrile stage; it is, however, less abundant. Whether or not the milk can convey the specific poison of malaria from the mother to the nursing infant is a question which as yet remains undecided. The most striking phenomenon in the puerperal state of women already infected with malaria is the reawakening of malarial manifestations, probably by reason of the traumatism and the physical depression following childbirth. The third day after labor seems to be the usual time for the reappearance of the disease, probably because of the slight elevation of temperature and of the general excitement of the organism which accompanies the establishment of lactation. The fever preserves during the puerperal state a perfect periodicity, a characteristic which much facilitates the diagnosis. Spiegelberg and Ritter, however, stand opposed to this doctrine. In their opinion, regularity in the occurrence of fever is very rare during the puerperium. The puerperal state predisposes always to grave forms of malarial intoxication.

These conclusions of Bonfils, while they are in the main correct, cannot be regarded as absolutely true. They illustrate the difficulty of arriving at definite conclusions in the study of any disease. Exceptions will be met with to almost every one of these propositions. For instance, I have seen malarial fever in the puerperal state, proven by the discovery of Councilman's bodies, pursue the mildest possible course, with very slight and irregular fever, which was easily controlled by the administration of quinine in small doses. On the other hand, the very worst example of malarial infection with which I have ever had to deal broke out in the last month of pregnancy. The patient had already, during the previous eight months, had two attacks of malarial fever. Within a week or two of term the disease again made its appearance in a very grave form. There were congestive chills, a temperature running to 104° and over, and finally unconsciousness. The fever was almost continuous in its type. In the midst of the disease labor came on, and after some difficulty the child was extracted by the breech. After delivery the symptoms became even more grave. It seemed that the woman's death was inevitable, but by the administration of seventy to eighty grains of quinine in the twenty-four hours for several days the fever was conquered and the woman made a rapid recovery.

DIAGNOSIS.—The diagnosis of malaria in the puerperal state usually presents many difficulties. If it were true, as has been asserted, that

the fever is always characterized by distinct periodicity, this difficulty would in great part disappear, but no one, it seems to me, who has had much experience in these cases can admit the truth of this assertion. The main difficulty is to distinguish between the fever which follows septic infection and that which is a manifestation of malaria. In cases of doubt it is a good plan to administer large doses of quinine, and at the same time to thoroughly disinfect the genital canal. If this plan is followed by immediate improvement, it is always difficult to say whether there was in reality malarial infection or whether the improvement was brought about by the disinfection of the parturient tract. With the recent discoveries in regard to the etiology of malarial fever the diagnosis should not be difficult if one has at hand the necessary appliances and possesses the skill to use them. The whole subject of malarial fever in the puerperal state has been thrown rather into discredit by the tendency exhibited to conceal cases of puerperal infection under this name. The practitioner should always be upon his guard in this respect. While not so satisfactory to him, it is far safer to his patient to err in the opposite direction, to regard a doubtful case of fever during the puerperium as of septic and not of malarial origin, unless the proof in support of the latter belief is overwhelming. A French reviewer has aptly said that in these conditions there is danger that, like the dog in the fable, one may let go the booty for the shadow.

TREATMENT.—It has seemed to me that in the majority of these cases larger doses of quinine are required than under other circumstances. Reference has been made to the case in which, on the average, 75 grains of this drug were administered in the twenty-four hours for several days hand running. In another case under my observation 45 grains a day were given for a long time, with success in controlling the fever and with no ill effect upon the patient. Several times an attempt was made to reduce the dose to 30 grains, but the reduction in the quantity of the drug was always followed by the reappearance of the fever. It was at one time taught that quinine administered to a nursing woman had a disastrous effect upon her milk. This has not the slightest justification in fact. Runge, who is perhaps the highest authority upon the subject, states definitely that quinine may be given without hesitation to nursing women. Even in very large doses it does not pass into the milk.

RHEUMATISM.

Articular rheumatism in the puerperal state is either a manifestation of septic infection, with a localization of the septic matter in a joint, or else, in the acute articular form of the disease, is simply an accidental

intercurrent affection. According to Celles¹ Charcot, in his doctorate thesis, published in 1853, was the first to call attention to rheumatism in the childbearing woman. During the following year Simpson in Great Britain and Virchow in Germany, in their works upon the puerperal state, mentioned articular rheumatism as one of its complications. The subject has since been studied by Peter, Loisin, Simon, Vaille, Braunberger, Boillereault, Tison, Quinquaud, Lacasagne, Hanot, Pinard, Siredey, Charpentier, Alexandre,² Hamill,³ and others. The diagnosis between septic arthritis and simple acute rheumatism is not always easy. In the latter during the puerperal state one sees all the characteristic symptoms of the affection, just as under any other circumstances. Inflammation of the joints following septic infection, on the other hand, presents certain peculiar signs. The joint affected is usually a large one, very often the knee; the inflammation is not fugacious;⁴ it is exceedingly stubborn in its resistance to all treatment; the duration is usually much prolonged; and in many cases there follows complete ankylosis of the joint. This affection may appear with very little evidence of general septic infection. It may make its appearance late in the puerperal state. It may be accompanied by very moderate fever of an irregular type. It is likely that in such cases a specific kind of micro-organism has found entrance to the body through wounds along the genital canal. The infecting microbe is perhaps the *Streptococcus articularum*. In the worst cases of general septic infection the joints may be a seat of metastatic abscesses as well as other portions of the body, but in these cases the symptoms pointing to a general septic infection are so plain as to indicate at once the origin of the malady. There is one factor which sometimes adds to the difficulty of diagnosis between acute articular rheumatism and a septic synovitis. A metastasis has been witnessed from the joints to the peritoneum in a case of rheumatism during the puerperal state.⁵ Such an occurrence would very likely arouse one's suspicion that the case was septic, and that the peritonitis and the joint disease had a common origin in a grave form of septic infection.

PROGNOSIS.—The average duration of the septic arthritis is about three months. Recovery is the rule, but with an ankylosed joint (16

¹ Marcel-Georges Celles: "Du Rhumatisme articulaire pendant l'état puerpéral," *Thèse de Paris*, 1885.

² For extensive bibliography see Celles, *loc. cit.*; Félix Barral, "Contribution à l'étude du Rhumatisme puerpéral," *Thèse de Paris*, 1885; Tarnier et Budin, *Traité de l'Art des Accouchements*, t. ii. p. 270.

³ *Am. Journ. of Obstet.*, 1888, p. 317.

⁴ There are, however, occasional exceptions to this rule (Barral, *loc. cit.*).

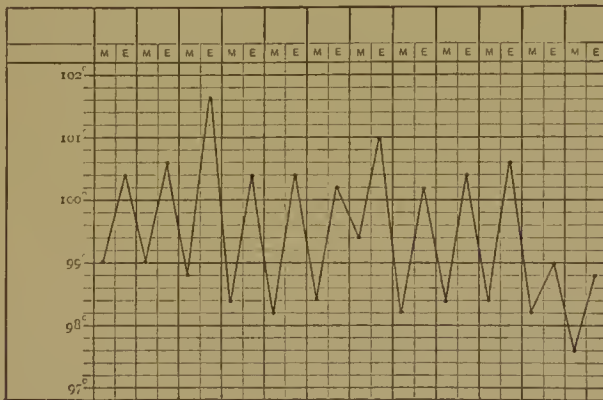
⁵ Alsldorf: "Peritonitis as a Metastasis of Acute Articular Rheumatism in the Puerperal State," *Am. Journ. Obstet.*, xx., 1887, 1032.

times out of 23, Tison). In scrofulous subjects the affected joint may become the seat of a white swelling.

TREATMENT.—General medication is of little use. Salicylate of sodium is of no value. Local treatment in the shape of counter-irritation (iodine, blisters, cauterization) may hasten the cure. If the inflammation is acute, soothing lotions must be used. The joint at first should be immobilized, but later a cautious employment of massage and passive motion may preserve the utility of the joint.

MUSCULAR RHEUMATISM may complicate the puerperal state. If the disease affect the uterine muscle, and is associated with much fever, the only means, practically, of distinguishing between this affection and puerperal infection with septic inflammation of the uterus is the therapeutic test—the administration of salicylate of sodium. The appended temperature-chart (Fig. 129) is of a woman in the Philadelphia Hospital who during pregnancy had an irregular fever with pain

FIG. 129.



and aches in all the muscles of the trunk. After an extended observation of the case, and some experimentation with other remedies, salicylate of sodium was administered, with immediate effect. I had forgotten the circumstance, and when, after delivery, this same patient developed fever with abdominal pain and uterine tenderness, she was treated by intra-uterine douches and large doses of quinine, without effect. It finally occurred to me that the woman had passed through an attack of rheumatism during pregnancy. The salicylate was administered again, with the result indicated on the chart.

GONORRHEA.

The frequency of gonorrhœal infection in the puerperal state, and the influence of the disease upon the woman's condition after labor, are matters at present under dispute. The evidence presented does not

justify, as yet, definite conclusions. Noeggerath and Sänger¹ take an extreme view of the frequency of this disease in the puerperium. The latter says that among 1930 gynecological cases during a single year in private and polyclinic practice, 230 (12 per cent.) owed their sufferings to gonorrhœal infection. Among 398 pregnant women, 100 had a purulent discharge (26 per cent.); 40 of the children developed blenorragia. This estimate is far too high to be correct. It might be true of certain localities, but the average number would fall very far below the proportion of cases that Noeggerath and Sänger believe can be discovered under all circumstances. For instance, Winckel, in an examination of 700 bodies in Dresden, had not once found a death from gonorrhœal disease of the appendages. While expressing his belief in the common occurrence of this disease, Sänger attempts to draw a sharp distinction between gonorrhœal infection and puerperal infection. He says: "If one finds in women who have borne children fresh or old perimetritic exudates, and in addition diseased adnexa, these abnormal conditions are almost always of gonorrhœal origin." The differential diagnosis between gonorrhœal and puerperal infection is, according to Sänger, to be made by the following signs: The progress of the disease in the former instance is slower. It very rarely appears in the early part of the puerperal state. It breaks out first about six or seven weeks after delivery. The most violent cases observed by Sänger were acquired during the period of uterine involution. The last statement would indicate that the experience upon which this observer bases his conclusions must have lain among a rather degraded class of patients. To my mind, it is quite impossible to draw in all cases a sharp distinction between infection by the poison of gonorrhœa and infection by the other pathogenic microbes which can occasion local inflammation in the genital tract. On the one hand, there are many of the infectious microbes which can cause a severe inflammation of the mucous membrane along the whole extent of the canal, and, on the other hand, the poison of gonorrhœa can, without doubt, excite inflammation of the deeper tissues in this region, and is quite certain, if it spreads through the tubes, to light up a sharp attack of peritonitis. The diagnosis can of course be made with approximate certainty if the disease existed during pregnancy or if a careful examination detects an inflammation of the urethra and of the vulvo-vaginal glands, or if it is possible to isolate the gonococcus. The consequences of gonorrhœa in the puerperal state can be of the most serious nature. It is not at all improbable that the organisms of this disease are capable, when absorbed in large quantities, of producing a severe form of general septic infection; witness the occurrence of joint affections in the course of a gonorrhœal attack.

"Ueber die Beziehung der gonorrhöischen Infection zu Puerperalerkrankungen," *Wien. med. Blätter*, 1886, S. 902.

The local inflammation under any circumstances may take on a very acute character, and may be accompanied by a violent peritonitis. There may be a rapid accumulation of pus in the tubes in the course of this disease during the puerperium. This, however, can occur just as well in the course of an ordinary septic endometritis after labor. Dr. Baldy has described a most interesting case of the kind which was relieved by an operation.¹ Perhaps a careful investigation into the cause of death from puerperal septicæmia would reveal in some instances a diseased condition of the uterine appendages, probably gonorrhœal, as the cause of the fatal termination. Grigg reports 4 cases of this kind which occurred in Queen Charlotte's Hospital. To my mind, they are not very good examples of the class. Although the appendages were diseased, it would be impossible to say that the morbid condition was not of a chronic nature dating long before the confinement, and that the general septicæmia with purulent peritonitis had not been acquired in the puerperal state on top of the older disease of the adnexa. One of these cases was exceedingly interesting as an illustration of the disastrous ultimate effects of perimetritic affections. In consequence of old adhesive bands the pregnant uterus was so dislocated that the ureters were much compressed, and in consequence enormously distended. The woman died of eclampsia, which in all likelihood was the result of the mechanical obstruction to the outflow of urine.

SKIN DISEASES.

The diseases of the skin which make their appearance during the puerperal state, and are apparently dependent upon that condition for their origin, are very likely a manifestation of septic infection. This is certainly true of the erythemata. It would appear to be true also of those cases of pemphigus which rarely occur after delivery. This disease² usually breaks out on the third or fourth day of the puerperal state. It may or may not be associated with some rise of temperature. In one case the contents of the blebs had a distinctly fetid odor. The duration of the disease is protracted. It lasts on the average perhaps ten weeks. It might be well in such cases to adopt at once an energetic disinfection of the genital canal, because in all likelihood the poison of the disease finds an entrance into the body by this channel. Any other form of treatment would seem to be of little avail. The woman's general condition may be weak and may need stimulant remedies. The distressing itching or burning of the skin which sometimes accompanies the disease can be relieved by soothing applications.

¹ *Tr. Philada. County Med. Soc.*, vol. i., 1887.

² Croft: "A Case of Pemphigus recurring after Four Consecutive Labors," *Lancet*, London, 1887, ii. 853; Wood: "A Case of Post-partum Pemphigus," *ibid.*, 1888, ii. 468.

DIASTASIS OF THE ABDOMINAL MUSCLES IN THE PUERPERAL STATE.

If the uterus has been much distended during pregnancy, and if the abdominal muscles during labor have been called upon to exert an unusual amount of force, there may occur a wide separation of the recti muscles, leaving space between them for a hernia of the abdominal contents which can give rise to rather distressing and even alarming symptoms in the puerperal state. Prochownick¹ has reported two interesting cases of the kind. There was suddenly developed during the puerperium sharp abdominal pain with nausea and vomiting. Careful examination excluded puerperal infection, and detected the protrusion of coils of intestine between the recti muscles. The hernia was easily reduced, and a recurrence prevented by a compress and adhesive strips. In both instances the symptoms yielded at once to this treatment. This accident is not likely to be a common one among English-speaking people and in countries where the use of the abdominal binder after labor is a universal custom. Prochownick during a journey through England was struck with the small number of women in all classes of society who exhibited pendulous abdomens, and attributed, without doubt correctly, the greater frequency of this condition in his own country to the neglect of precautions after delivery to maintain the tone of the abdominal muscles and to reduce as much as possible the size of the abdominal cavity.

FLATULENT DISTENSION OF THE ABDOMEN.—There occurs occasionally in the puerperal state of nervous women an extreme distension of the abdomen, due to the over-distension of the intestines with gas. In these cases the origin of the flatulence is distinctly nervous, and should not be confounded with the same condition which accompanies peritoneal inflammation. Even in the non-inflammatory cases the great distension of the abdomen bears with it a train of symptoms always distressing and occasionally threatening in their nature. In the worst cases of the kind the only remedy which seems to afford relief is a puncture of the large intestine with a fine trocar. This procedure would appear to be devoid of danger. It has long been applied in the treatment of animals, especially sheep, to relieve the flatulent dyspepsia which sometimes follows the ingestion of too large a quantity of succulent food. It has now been also adopted with good results in human beings. Dr. Franklin of India recently communicated to Priestley of London the details of a very interesting case.² A young woman after the birth of her first child developed a flatu-

¹ "Die Diastase der Bauchmuskeln im Wochenbett," *Archiv f. Gynäk.*, xxvii. 419.

² Priestley: "Note on Puncture of the Abdomen for Extreme Flatulent Distension," *Lancet*, London, 1887, i. 718.

lence which gave rise to alarming symptoms. Everything else failing to afford relief, the ascending colon was tapped twice—once on the third and once on the fifth day. Both operations were followed by immediate relief of the distressing symptoms. The last one cured the patient permanently. Priestley, in commenting on this case, refers to others somewhat similar, outside, however, of obstetric practice, reported by Wagstaffe in 1877 and by Broadbent in 1879. Mr. Bryant in 1872 tapped the intestine in a case of hernia with intestinal distension. No feces escaped from the opening, and but a single drop of blood oozed out. In one recorded instance the bowel was tapped twenty-eight times without bad result. Dr. Priestley gives Braxton Hicks the credit of having first suggested this procedure in puerperal cases, although he had never put it to a practical test.

There are of course many other acute and chronic affections besides those already described which can complicate the puerperal state. They are, however, purely, accidental complications, which neither produce a distinctive change in the course of the puerperium nor are themselves modified by the woman's condition. As examples of the kind might be mentioned dysentery, intestinal parasites,¹ inflammation of the vermiform appendix,² miliary tuberculosis,³ acute pancreatitis,⁴ miliary fever, hepatic colic,⁵ and gangrene of the ilium,⁶ besides many more, the list of which will include almost all the pathological conditions to which the adult female is subject.

DISEASES OF THE URINARY SYSTEM.

Urine.—Gassner⁷ was the first to point out that the excretion of urine after delivery was very much increased. In one case which he reports the quantity reached 10 kilogrammes in forty-two hours. There was in this case very well-marked œdema, but even under normal circumstances there is an increased diuresis in every healthy puerpera. Winckel has investigated this point very fully, and he comes to the following conclusions in regard to the quantity of urine excreted and to the modifications in its constituent parts during the puerperium: During the first two days the increase in quantity is most marked. The fluid is clear and of a light-yellow color. The specific gravity is very low. The absolute quantity of urea, phosphates, and

¹ *Indian Medical Gazette*, xxii. 240.

² Dearborn. *Vermiform Appendicitis and General Peritonitis complicating the Puerperal Period*.

³ *Centralbl. f. Gynäk.*, 1885, ix. 417.

⁴ *Ibid.*, 1884, viii. 609.

⁵ *Ann. Soc. d'Hydrog. méd. de Paris*, 1887, 169.

⁶ *Frauen Arzt.*, Berlin, 1886, i. 308.

⁷ Winckel: *Pathol. u. Therap. des Wochenbettes*, p. 11.

sulphates is somewhat diminished, but the amount of sodium chloride is not altered. The urine gradually during the progress of uterine involution regains its normal qualities. The average amount of urine passed in the first six days reaches 11,160 grammes. The average specific gravity is 1010. The quantity passed upon each day averages as follows: the first day, 2025 c.c.; the second day, 2271 c.c.; the third day, 1735; the fourth day, 1772; the fifth, 1832; and the sixth, 1949. It is not at all rare to find albumen in the urine¹ shortly after delivery, but as this is only a temporary phenomenon, disappearing within forty-eight hours as a rule (Blot, Ingerslev, Lantos), and seems to exercise no injurious influence upon the woman's condition, it may be regarded as practically a physiological occurrence. Maguire² compares the albuminuria of the puerperal state with the cyclical albuminuria met with under other circumstances, and says that very likely in both these conditions the precipitate with nitric acid and heat is globulin and not serum albumen. The globulin may be separated by saturating neutralized urine with sulphate of magnesium in the cold. Lantos ascribes puerperal albuminuria to a spasm of the arterioles in the kidney, brought about by reflex irritation of the vaso-motor nerve-fibres pinched in the contracting uterus. I think it more likely due to some degree of what Gauchier³ calls a "nephritis by auto-intoxication." The kidney is overtaxed in the struggle to get rid of the effete products of tissue-activity, the store of which is much increased in the maternal body by the life-processes of the fetus just expelled, and by the rapid disintegration of some two pounds of flesh—the uterine muscle. The appearance of sugar in the urine after delivery is also a very common occurrence, which has been attributed to the absorption of lactose from the mammary gland; and, indeed, one observer declares that the quantity and quality of the milk may be judged by the amount of sugar in the urine.⁴ But, as a matter of fact, glycosuria is more common in cases where the milk secretion fails than in others where the supply is most abundant.⁵ Curiously enough, the amount of urea in the urine does seem to depend on the excretion of milk; the former increases with the increase of the latter.⁶ This statement would also

¹ Examining the urine of 600 puerperæ directly after delivery, Lantos found albuminuria in 59.33 per cent. This is a more common occurrence by one-third in primipare than in multipare ("Beiträge zur Lehre von der Eklampsie und Albuminurie," *Arch. f. Gyn.*, Bd. xxxii. p. 365).

² "Pathology of Puerperal Albuminuria," *London Lancet*, Sept. 18, 1886.

³ "Recherches expérimentales sur la Pathogénie des Néphrites par Auto-intoxication," *Revue de Médecine*, Novembre, 1888. ⁴ Blot: *Comptes rendus*, xliii. p. 676.

⁵ Hofmeister: *Ztschr. f. Phys. Chemie*, Bd. i. S. 703; Johannovsky: *Arch. f. Gyn.*, Bd. xii. S. 448. A full bibliography on this subject may be found in *Schroeder's Geburtshülfe*, 10th Aufl., p. 236.

⁶ Grammatikati: "Ueber die Schwankungen der Stickstoffbestandtheile des Harns in den ersten Tagen des Wochenbettes," *Centralbl. f. Gynäk.*, 1884, p. 353.

seem to hold good of the phosphates and the sulphates, these increasing with the urea and with the excretion of milk.¹ A modification in the urine of puerperal patients to which attention has been called in recent times presents much of physiological interest, if not of practical importance. This is the appearance of peptones in the urine of recently-delivered women. The matter has been of late quite extensively investigated, and the following conclusions appear to be justified:²

1. Peptonuria is constant in the puerperal state. The quantity of peptones, however, in individual cases varies considerably.

2. The urine contains usually no peptone on the first day, but thereafter until the fourth day the quantity increases steadily; then begins to decrease, and disappears on the twelfth day.

3. The peptonuria is probably the result of the direct conversion of the uterine muscle into peptone.

4. After the delivery of macerated infants one finds no peptone or only a very small quantity; and this is the smaller the longer the time since foetal death. The uterine involution seems in these cases to progress much more rapidly than after the birth of living children.

5. Occasionally peptone is found during the latter days of pregnancy. In these cases peptonuria can be demonstrated directly after birth and in the first day of the puerperium, but in lesser quantities than in other puerperæ.

6. The difficulty of a labor and its length exercise no influence upon the peptonuria.

7. The peptonuria stands in direct relation to the involution of the puerperal uterus.

8. The specific gravity of the urine is in direct relation with the quantity of peptone in it.

9. The peptones formed in the uterus behave in the blood like the digestion peptones, or like the peptones that are artificially introduced into the circulation.

10. The quantity of the peptones in the urine is in direct ratio to the number of white blood-corpuscles in the blood of the individual puerpera.

The lochia can also contain peptones, but this is independent of the peptonuria, and influences in no degree the occurrence or the quantity of peptones in the urine. A careful examination of the uterus and its lining membrane after delivery demonstrated that in the uterine muscle considerable quantities of peptones could be discovered, while in the lining membrane this substance could not be found.³ Fischel declared

¹ Grammatikati: *Op. cit.*, p. 467.

² Fischel: "Ueber puerperale Peptonurie," *Arch. f. Gynäk.*, 1884, xxiv. p. 400, and "Neue Untersuchungen über den Pepton-gehalt der Lochien Nebst Bemerkungen über die Ursachen der puerperalen Peptonurie," *ibid.*, 1885, xxvi. 120; Biagio: "La Peptonuria puerperale," *Ann. di Ostet.*, 1887, ix. 202.

³ Fischel: *Loc. cit.*

that he found peptones in one-quarter of all the cases of pregnancy examined. It would seem, therefore, if this is true, that the claim which has recently been advanced for the diagnostic value of peptonuria in recognizing foetal death during pregnancy is very slight.¹ If the urine contains albumen in considerable quantities and persistently, it is pretty good evidence of some serious trouble in the kidneys. There will be usually associated with persistent albuminuria other symptoms indicating kidney disease. One of these is acute pain, most often in the head, but sometimes referred to the epigastrium or to other regions of the body.² There may be œdema. There will be found in the urine microscopical evidence of degenerative changes in the renal epithelium. Albuminuric retinitis is not a very uncommon accompaniment of kidney disease in the puerperium. This may induce complete blindness, but it should be recollected that there may occur, although it is rare, a temporary blindness in the puerperal state independent altogether of kidney trouble.³ This usually comes on shortly after delivery, and lasts for a few days. Typical examples have recently been reported by Brush and by Königstein. The latter attributes the accident to a spasmodic contraction of the retinal vessels traceable to some vaso-motor disturbance. This author thinks there may be some connection between contraction of the uterine vessels and the action of the central artery. He refers to a similar case in a non-pregnant woman due to the passive congestion of the abdominal venous system which accompanied a very exaggerated pendulous abdomen. This symptom, loss of vision, may follow severe hemorrhage or eclampsia, may be associated with albuminuria, or may be the result of a septic panophthalmitis. Königstein suggests as a treatment for the temporary blindness due to a spasmodic action of the retinal vessels the inhalation of amyl nitrate. The woman's nervous system seems to exercise a powerful influence on the composition of the urine. Cameron⁴ of Montreal has recently reported an extraordinary case of high temperature and glycosuria in the puerperal state, the result of nervous influences. The range of temperature was quite remarkable, rising during waking hours and falling during sleep, without corresponding variation in pulse. The glycosuria seemed to have direct connection with the nervous phenomena and lasted only a short time.

¹ Köttnitz: "Ueber Peptonurie in der Schwangerschaft," *Deutsche med. Wochens.*, 1888, No. 30.

² Raven: "Note on Puerperal Albuminuria," *Lancet*, London, 1888, ii. 715; Phillips: "Acute Epigastric Pain in the Puerperal Albuminuria," *ibid.*, 1887, i. 676.

³ Brush: "A case of Temporary Blindness following Childbirth," *Obstet. Gazette*, vii., 1884; Königstein, "Erblindung nach einer Geburt in Folge von Ischæmia Retinæ," *Wien med. Presse*, 1885, xxvi. 585.

⁴ "High Temperature and Glycosuria in the Puerperal State, the Result of Nervous Influences," *Montreal Med. Journ.*, Jan., 1889.

The Kidneys.—Hervieux divides the diseases of the kidneys in the puerperal state under four heads: First, inflammatory nephritis; second, metastatic nephritis; third, the evanescent albuminuric nephritis; and fourth, the subacute albuminuric nephritis. In the first stage of inflammatory nephritis one finds hyperæmia and tumefaction of the organ. Very often this is associated with general septicæmia, but one sees sometimes very much the same condition occur acutely during the last weeks of pregnancy, and end perhaps, as in one of my own cases, in fatal eclampsia during or directly after labor. If the disease develops primarily in the puerperal state, it is very likely a manifestation or an accompaniment of general septic infection, and will, in the vast majority of cases, go undetected in the midst of other complications presenting more obvious and more alarming symptoms. An intense hyperæmia of the kidney may result in an apoplexy of the organ. In the cases where this was noted there was also general septicæmia. Metastatic nephritis is of course the result of septic infection, and need be considered here no further. In the evanescent albuminuric nephritis, according to Hervieux, the kidney is increased in size. Its surface is smooth; the fibrous tunic, thickened and injected, is easily stripped off. The increase in the size of the organ is due principally to the tumefaction of the cortical substance. In the fourth variety of kidney diseases in the puerperal state the course is a more tedious one, and the disease may pass into chronic nephritis. Maguire asserts that the lesion most commonly found in cases of puerperal albuminuria is one of anæmia of the kidney with fatty degeneration, not, as heretofore supposed, a condition of passive congestion. Lantos¹ too, in the records of 39 post-mortem examinations of puerperæ who had neither died from eclampsia nor nephritis, found in 15 cases the kidney described as "anæmic," in 21 "pale," and only in 3 "congested." Among 16 women who had presented symptoms of kidney disease there were found twice acute parenchymatous nephritis, once acute hemorrhagic nephritis, nine times parenchymatous degeneration, and four times albuminoid degeneration.

The Ischuria of the Puerperal State.—The cause of the difficulty experienced in the evacuation of the bladder in such a large proportion of women after delivery has given rise to a lively discussion without, as yet, perfectly definite results. Olshausen² attaches great importance to the deviation or angulation of the urethral canal which is produced in consequence of the oblique position of the head within the pelvic cavity during a greater part of the labor. Schroeder³ attributes the retention of urine after delivery rather to the increased capacity of the bladder acquired during pregnancy. In a careful study of this matter

¹ *Loc. cit.*

³ *Lehrbuch*, 10te Aufl., S. 236.

² *Arch. f. Gyn.*, Bd. ii. S. 273.

made recently by Schwarz¹ the conclusions reached, I think, are more nearly correct than either of the two just mentioned. This author attributes the greatest importance to the intra-abdominal pressure in the evacuation of the bladder, and denies, with seeming justice, the ability of the bladder-walls to contract firmly. He points out that ischuria occurs as well after the removal of abdominal tumors or the evacuation of ascitic fluids as after labor. In his opinion, the ischuria of the puerperal state is dependent either upon an obstructed urethra or else upon a lack of that intra-abdominal pressure which is always necessary to drive out the urine. Under the first head as causes of obstructed urethra might come œdema of the urethral walls and surrounding tissues; compression, deviation of the urethral canal, and a nervous inability to open the sphincter muscle.

The second cause, much diminished intra-abdominal pressure, is brought about, of course, by the great reduction in the size of the abdominal contents after the evacuation of the uterus. The stretched abdominal walls are unable to act with sufficient vigor to close up at once the space that has thus been gained. It has been asserted that paralysis of the bladder-walls may sometimes be held accountable for the inability of the bladder to expel its contents. This doctrine is inadmissible if one accepts Schwarz's view, that the contraction of the bladder-walls plays almost no part in the expulsion of the urine. If such a condition is, in fact, ever met with, it must be extremely rare. Winckel in an enormous experience declares that he has never seen a single case. The preventive treatment of inability to pass urine after delivery is a matter of some importance. If the patient is instructed to practise urination in the supine position during the last weeks of pregnancy, the catheter will in the great majority of instances be found unnecessary after delivery. Skutsch² found that among 29 puerperæ who had been managed in this way only 8 required a catheter after delivery—7 for one day, 1 for two days. Of 13 patients, on the other hand, who had not practised urination on their backs, 8 required catheterization during the puerperal state. Schatz³ manages his cases of ischuria in puerperæ by dilating the urethra with an instrument like a glove-stretcher, until a small-sized little finger might be passed into the bladder. He claims that this relieves him from all further trouble. After one stretching, as a rule, the woman is able to pass her water naturally. Occasionally, a second dilatation is required. This might be a useful manoeuvre in country practice, where the physician must

¹ "Zur Aetiologie der Ischurie im Wochenbett und nach der Extirpation respect. Punction Grosser Unterleibstumoren, nebst Bemerkungen über den Mechanismus der Urinentleerung überhaupt," *Ztschr. f. Geburtsh. u. Gynäk.*, 1886, Bd. xii. 86.

² *Verhandl. der Deutsch. Gesellsch. f. Gynäk.*, Bd. ii. 1888, p. 120.

³ "Dilatatio Urethræ bei Ischuria Puerperarum," *Verhandl. der Deutsch. Gesellsch. f. Gynäk.*, Bd. ii. 1888, p. 118.

travel long distances to draw the urine, or among the poor, who cannot command skilled attention. There should be no objection to the use of the catheter when it is required, in the hands of a skilled nurse impressed with the importance of clinical cleanliness.

Incontinence of Urine.—There may be an involuntary escape of urine after labor in consequence of an overfilled bladder, of paresis in the sphincter muscle, and of a perforation communicating with the vagina and some portion of the urinary tract. The first cause in a case of the kind should always be suspected and looked for, as it is perhaps the most common. The treatment must vary with the cause of incontinence. The use of a catheter will remove the difficulty in cases under the first category. Cases of the second group are more difficult to deal with. The partially paralyzed muscle will, as a rule, regain its tone in a short time; and by an expectant treatment, therefore, one may expect to see the difficulty soon overcome. It might be possible to hasten recovery by the use of tonics, local astringents, or perhaps electricity. The preventive treatment should never be neglected. These cases almost invariably follow delayed and difficult labors with head presentations. A timely interference, therefore, would save the woman the discomfort, and even danger, of a constant dribbling of urine over the external genitals.¹

Cases of the third order should be managed by attempting to obtain a primary closure of the fistulous opening. This can be effected in some cases, if the fistula is not too large, by touching its edges with a strong caustic like nitric acid.

Cystitis.—Cystitis is unfortunately a common occurrence in the puerperal state. It is due in the vast majority of cases to a careless, clumsy, or ignorant use of the catheter. The old plan of introducing a catheter under the bed-sheet is no doubt responsible for a large number of these cases. If physicians and nurses conduct this procedure as Dr. Garrigues recommends,² there would be very little risk indeed of infecting the bladder mucous membrane by the use of the catheter. A passing inflammation of the bladder may be due to long-continued pressure or to injury during birth; but such cases are rare. The cystitis is almost always a septic disease following the infection of the bladder mucous membrane by one or a number of micro-organisms. Bumm³ claims that there is always a diplococcus to be found in the urine of such cases closely resembling the gonococcus, but possessing certain individual characteristics. This fungus is, according to Doléris, always present in the lochia, and

¹ Bechadergue-Lagrèze: "Incontinence d'Urine sans Fistule consécutive à l'Accouchement," *Thèse de Paris*, 1886.

² See preceding section.

³ "Die Aetologie des puerperalen Blasenkatarrhs nach Beobachtung an Wöchnerinnen und Thierversuchen," *Centralbl. f. Gyn.*, 1886, 443.

is carried into the bladder upon a catheter. It is possible that micro-organisms can migrate from the vagina along the mucous membrane of the urethra to the bladder without the intervention of catheterization. In order that the micro-organisms, having gained access to the bladder, may bring about an inflammation of the vesical mucous membrane, it is necessary to have a condition of that tissue favorable to the invasion and the growth of the microbes. The invasion is much facilitated by a solution of continuity in the mucous membrane. It is also favored by reduction in the vitality of the vesical epithelium, which follows prolonged pressure upon the bladder during labor, or is a consequence of the over-distension of the bladder-walls from prolonged retention of urine. In the discussion that followed Dr. Bumm's paper, Olshausen declared his belief that the infecting agent in cystitis is not always the same. This is no doubt true. Olshausen also referred to a disposition of the inflammation in some cases to spread rapidly toward the kidneys, so that after the bladder affection is cured the kidney disease remains behind. There may be intermissions for some length of time of apparent health between the infection of the bladder and the outbreak of disease in the pelvis of the kidney. The termination of cystitis after delivery is, in the vast majority of cases, favorable. The inflammation may, however, persist for a long time, and may become, perhaps, an inveterate chronic affection. In the worst cases of septic cystitis the disease manifests most alarming symptoms and can end fatally.¹

There is in some cases a thick, diphtheritic infiltration of the mucous membrane, which is finally exfoliated and discharged by the urethra in thick masses. In other cases, again, the mucous membrane becomes gangrenous, and is finally expelled in fragments of varying size along with the urine. Pieces of the infiltrated mucous membrane lying loose within the bladder may obstruct very seriously the outflow of urine, and the retention of the fluid adds considerably to the gravity of the symptoms. In these extreme cases the urine is full of pus, blood, albumen, and renal tube-casts, and it very often has a horribly fetid odor.

Pyelonephritis.—An inflammation of the pelvis of the kidney may follow infection of the bladder by an extension of the disease along the ureters. Very likely this is true of the vast majority of cases, but in some instances the bladder disease may be of such a transient nature that it passes undetected, and the physician's attention is first attracted by the subsequent pyelonephritis. It is possible, at least, that the infection in a case of pyelonephritis may occur in the kidneys from the blood. The disease may follow mechanical irritation from renal calculi. Within the past year, I have had two examples of pyelonephritis to

¹ Boldt: "Cystitis Suppurativa Exfoliata Puerperalis," *N. Y. Med. Record*, 1885, ii. 497.

deal with during pregnancy, presenting very much the same symptoms, and in each case of most obscure origin. The history of one of these cases is as follows :

A young primigravida in the fifth month of pregnancy, previously, to all appearance, in good health, became rather suddenly dull and stupid. Feeling quite ill she went to bed. There had been slight epistaxis and the bowels had been constipated. There was a distressing headache, and the woman's mental condition was exceedingly apathetic. She was with difficulty aroused, and answered questions in a stupid, dazed sort of way. The urine was passed involuntarily in the bed. In the course of the next two days there appeared a low muttering sort of delirium, and there was vomiting. During all this time there had been no fever. The temperature, on the contrary, was subnormal. On the seventh day of the disease the temperature began to rise. There came on a vaginal discharge which was at first catarrhal, but soon became bloody. In the course of the next twenty-four hours the foetus was expelled. After lasting for four days the fever disappeared, but the woman's condition remained the same—great mental apathy, verging on a low form of delirium, extreme prostration, and a subnormal temperature. The only symptom which could be elicited in this case to account for the woman's state was pus in the urine, which evidently came from the kidneys, for both ureters were catheterized, and in the specimens of urine from each kidney pus was discovered. How the primary infection of the bladder occurred in this case and in the other one, which closely resembled it in many particulars, it is difficult to say. The septic inflammation having extended to the kidneys, however, it is not so difficult to understand how symptoms of general body infection should be produced. Schweizer¹ has shown that micro-organisms can pass from the urine in the kidneys into the blood, and from the blood back again into the urine. In both the cases referred to, after persisting for some weeks subsequent to delivery, the pus finally disappeared from the urine; and its disappearance was coincident with a marked improvement in the general symptoms. Both cases ended ultimately in a perfect recovery. I have seen one case of pyelonephritis during the puerperal state which was associated with renal calculi. There was a sudden exacerbation of the disease some few days after labor, associated with a high fever and a suppression of urine. The attack passed off in the course of forty-eight hours, however, and the woman finally recovered. It is difficult to lay down a satisfactory plan of treatment for these cases. The best results, apparently, are achieved by the administration of unirritating diuretics and the adoption of a tonic and

¹ "Ueber das durchgehen von Bacillen durch die Nieren," *Virch. Arch.*, Bd. ex., S. 255.

supporting treatment. The disease usually ends in recovery, although its course may be a protracted one.

Hæmaturia, when seen in the puerperal state, has almost invariably persisted from pregnancy. In these cases there are bleeding hemorrhoids of the bladder, due to the mechanical interference with the pelvic circulation by the presence of the gravid womb. The blood disappears from the urine in a few days after delivery. In bad cases of septic infection of the vesical mucous membrane, as a result of injury with instruments or as a consequence of vesico-vaginal fistulæ, the same symptom may appear, but the differential diagnosis is easy.

ABNORMALITIES IN THE MILK SECRETION.¹

Milk secretion begins usually forty-eight hours after delivery. Previous to this time a thin fluid can be squeezed from the breast containing large cells, within which are contained many fat-globules. To this substance the name "colostrum" has been given, and these cells are called colostrum-corpuscles. It is difficult to estimate the exact quantity of milk secreted at any time, but especially so at first. The best way to determine this point is to draw the milk with a breast-pump at regular intervals during the twenty-four hours; but the breast-pump does not excite maternal emotion, hence it always draws a less quantity than would be furnished a suckling infant, for the breast is in some slight degree an erectile organ, and even the sight of the child may be sufficient to produce a flow of milk. Allowing for these errors, there will be found at the end of the seventh day about fourteen ounces in the twenty-four hours. During the five preceding days the quantity is small and variable. By the end of the fourth week the quantity of milk secreted in the twenty-four hours reaches about two pints. From this time it increases gradually until the sixth or seventh month, when about three pints of milk can be drawn from the breast in twenty-four hours. After the eighth month the quantity of milk gradually decreases. A curious anomaly of milk secretion is its occurrence independent of the puerperal state, as in very old women or very young girls, after operations upon the ovaries,² at the menstrual period,³ or even in the adult male.⁴ The most important abnormalities of milk secretion, however, may be grouped under two main headings: Quantitative and Qualitative.

¹ This subject has been separated from the inflammatory diseases of the breast because, in the opinion of the Editor, the latter are so closely allied to the inflammatory conditions about the sexual organs after delivery, in their etiology at least, that they should be considered in close connection and by the same author.

² Penrose: *M. and S. Rep.*, 1889, 326.

³ Sinéty: *Traité de Gynéc.*, p. 955.

⁴ John Hunter's *Notes*, quoted by Barnes; Humboldt: *Reise in die Aequinoctial gegenden des neuen Continents*, Bd. ii. S. 40.

ANOMALIES OF QUANTITY.—The most frequent anomaly of quantity in milk secretion is unfortunately one of defect—too small a secretion for the needs of the infant. In its extreme degree the anomaly goes by the name of agalactia, complete absence of milk. This, however, is of exceedingly rare occurrence. Winckel in an enormous experience asserts that he has never seen an example—that there is always some little milk secretion, which may, however, pass undetected without close observation. There are a few recorded cases of complete absence of both breasts. Under such circumstances of course there would be after delivery complete agalactia, so that, although this condition is doubtless one of great rarity, its occurrence is a possibility. Defective milk secretion is by no means uncommon. Many causes may be operative in preventing normal activity in the gland. In cases of premature maternity, when the individual is not yet fully developed, one may see this condition to a marked degree, but I have on two occasions been called upon to attend young mothers not over fourteen, and in both instances the milk secretion was ample. Advanced age is another cause assigned for defective lactation. There is either an atrophy of the gland or an exhaustion by previous activity. The nearest approach to complete agalactia which I ever witnessed was in the case of a woman who had her first living child at the age of forty-three. She had been married at forty, and had had previously two children stillborn. There was in this case such a slight manifestation of milk secretion that it might have passed undetected without a careful search.

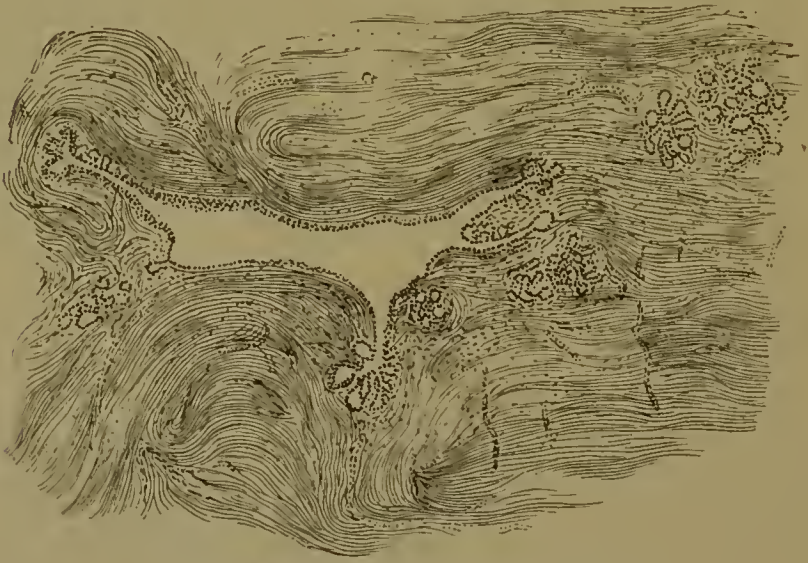
Perhaps the most frequent cause of insufficient milk secretion is a lack of development in the glandular tissue. This may be hereditary, may depend upon the continuous pressure from the clothing, or may be associated with a defective development of the remainder of the body. Altmann¹ has called attention recently to the hereditary form of atrophy in the mammary gland. This can best be studied, perhaps, in parts of Bavaria, where it has been the custom for centuries to nourish the children artificially. In Munich, of the women who did not nurse their infants, 58 per cent. were said to be physically unable to do so. Of the women who nursed their children, 70 per cent. had to resort to mixed feeding. In other parts of Germany, on the contrary, notably in Silesia, where the custom of suckling children has been carefully preserved for many generations, it is rare to find mothers unable to nurse them on account of an insufficient supply of milk.

According to Altmann, one may see the effect of heredity upon the mammary gland in the cow. The large udder which is characteristic of the domestic animal appears to have been developed by the custom of milking carried through many hundred generations; for Stumpf is

¹ "Ueber die Inactivitätsatrophie der weiblichen Brustdrüsen," *Virch. Arch.*, Bd. cxi, p. 318.

quoted to the effect that in none of the Egyptian drawings is there figured a cow with an udder. In the course of his article Altmann calls

FIG. 130.

Mammary Gland of a Nullipara (from Silesia). $\times 52$.

attention to a fact of practical importance: in forming a prognosis in the individual case upon the likelihood of supplying the child with sufficient nutriment, one should not be influenced by the size of the mammary gland, for in some cases a large organ is made up chiefly of connective tissue, while in others apparently ill developed the gland tissue is abundant and the milk-supply ample. During pregnancy the

FIG. 131.

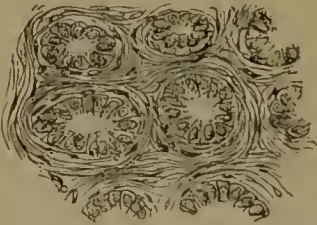


FIG. 132.

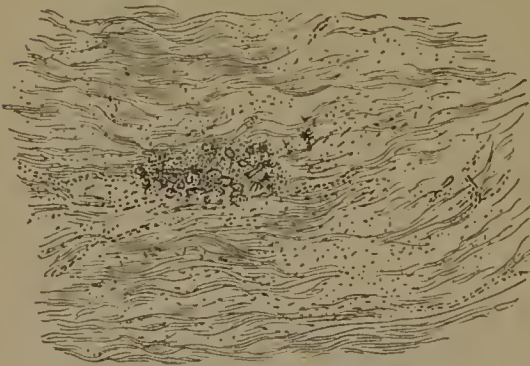
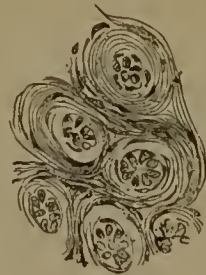


FIG. 133.

FIG. 131.—The Same as Fig. 130. $\times 320$.FIG. 132.—Mammary Gland of a Nullipara (from Bavaria). $\times 52$.FIG. 133.—The Same as Fig. 132. $\times 320$.

glandular structure of the breasts takes on an active growth and devel-

opment, while the connective tissue decreases to a marked degree. If lactation is not practised, there begins at once an involution of the gland, a shrinkage of the epithelial structures, and a regrowth of connective tissue. If involution is allowed to occur after the birth of the first child, it is more difficult after subsequent deliveries to awaken the breast to functional activity.

There is another class of cases in which mammary secretion, at first sufficient, becomes at some period during the time of active lactation much diminished. This will occur sometimes as the result of hemorrhages or of diarrhœa. It may be the consequence of an acute febrile attack during lactation or of inflammation within the gland itself. Serious organic diseases may also be a cause, and insufficient nourishment must be held accountable in some cases. During the siege of Paris this was plainly demonstrated. A close observation of 43 nursing-women by Decaisne¹ proved that with imperfect nutrition the total quantity of the milk is much decreased. Of these 43 women, almost one-third lost their children from starvation. Emotions exert an extraordinary influence upon lactation. Those which are of gradual development and long continuance, as profound grief, tend to progressively diminish the amount of milk. Emotions of sudden onset and short duration, as fright or anger, either totally stop the formation of milk or else so alter its constitution that it becomes a rank poison to the child. The return of menstruation will sometimes affect the quantity and quality of a woman's milk, but not nearly so often as is popularly supposed. Zweifel states positively that for the most part the return of the menses is without influence upon lactation. This statement is in accord with the experience of Winckel, Joux, Tilt, Becquerel, Vernois, and many more. There are a few other rarer causes to which deficient mammary secretion has been ascribed. It has been said that the exit of the milk-ducts may be obstructed by an accumulation of epithelium—that this may be recognized by discovering a minute white, projecting, translucent vesicle upon the nipple at the opening of the obstructed duct. Nasal, pharyngeal, or bronchial catarrhs are supposed to diminish the quantity of milk. The mammary gland is described in some cases as torpid. A failure to furnish enough milk is ascribed occasionally to the fact that the individual approaches the male type. The milk-supply is rarely abundant after premature delivery or the delivery of dead infants. It is also an undoubted fact that extreme obesity interferes seriously, if it does not almost entirely prevent, a functional activity of the mammary gland.

TREATMENT.—From what has been said, it must appear that no single plan of treatment can be advocated to overcome insufficient

¹ "Des Modifications que subit le lait de femme pour suite d'une alimentation insuffisante; observations recueillies pendant le siège de Paris," *Comptes rend.*, lxxiii. No. 2.

mammary secretion. It must also be plain that in the vast majority of cases the cause of the difficulty is beyond the influence of any treatment. We cannot alter the age of the patient nor replace glandular tissue when it is deficient either from hereditary defects or the influence of causes which have prevented its development. There are some cases, however, of insufficient secretion that will respond promptly to appropriate therapeutic measures. If the want of milk is dependent upon a scanty diet, that can easily be corrected. It should never be forgotten that when lactation is interrupted by an acute febrile attack, lactation may be successfully resumed after convalescence is established, even though weeks and occasionally months have intervened. In cases of general ill-health or constitutional weakness much may be effected by the administration of tonics, and nutritious diet and change of air and scene. If the deficient secretion is dependent upon some emotion, the cause, if possible, must be removed. Electricity has been much vaunted of late as a remedy for insufficient lactation. It may be applicable in cases of torpidity of the mammary gland or in those cases where lactation was not practised after the birth of the first infant, and in which, therefore, the mammary gland does not respond readily to the stimulus imparted to it by subsequent births. This remedy, will, however, often prove ineffective and disappointing.

QUANTITATIVE ANOMALIES BY EXCESS in the milk secretion may take several forms. In women of a vigorous physique, well nourished, and of a full habit the supply of milk is very apt to be in excess of the infant's needs—polygalactia. Lactation may be continued far beyond the usual time—hyperlactation. In the third variety of anomalies the milk secretion continues to flow from the breasts in varying quantities and for varying lengths of time after the child has been weaned—galactorrhœa.

Polygalactia.—This condition is exceedingly common. Its treatment has been referred to by Dr. Garrigues in a preceding section. The main features of it are compression of the breast, the administration of laxatives, the regulation of the diet, and evacuation of the superabundant quantity of secretion.

Hyperlactation.—This is more frequently met with among the poorer classes. Infants are nursed far longer than they should be, either from the fact that it is difficult to provide food for another mouth, or because of the prevalent belief that lactation grants immunity from impregnation. Women have been known to nurse their children up to the second or third year. Barnes tells of a Spanish wet-nurse who suckled three successive children in one family. This practice may lead to serious results. A woman may become excessively weak, and present all the symptoms of a serious constitutional disease. The quantity of blood is diminished—oligæmia. The woman grows pale and

thin; there are loss of appetite, constant headache, pain in the back, indisposition to make any physical effort, and the whole nervous system is more or less seriously deranged. Cramps in the muscles of the neck and upper extremities occur not infrequently: they appear often during the day, and last for varying periods. The application of the child to the breast often originates an attack (Winckel). There is especial danger in women of tuberculous tendencies of originating phthisis. Indeed, it is a question whether a woman of doubtful family history and a disposition to pulmonary inflammations should be allowed to nurse her infants at all.

The treatment of hyperlactation is simple and effective. The child must at once be weaned and the mother's strength restored by a nutritious diet, tonic remedies, and, if possible, change of air.

Galactorrhœa.—By this term is meant a flow of milk from the breasts, not necessarily excited by the suckling child, and commonly continued long after the usual term of lactation. The quantity of milk excreted may vary from a few grammes up to 7 litres in the twenty-four hours.¹ Usually both breasts are involved; sometimes the flow is confined to one side. The cause of this anomaly is unknown. It has been attributed to a relaxation or paralysis of the circular muscular fibres surrounding the milk-ducts, but, as Winckel remarks, this, in the majority of cases, is an effect and not a cause. There is a case recorded, however, of galactorrhœa in the left breast associated with the left hemiplegia occurring after childbirth.² The affection is one commonly of long duration, extending often over years. There is a case reported in which for thirty years there was an uninterrupted flow of milk from the breasts of a woman who at the time the report was made had reached her forty-seventh year. Curiously enough, this long-continued drain upon the system had had no injurious effect upon the woman's health, which remained excellent. Another anomalous feature in the case was that the return of the catamenia increased for the time the discharge of milk.³ The usual effect of a long-continued discharge of milk from the breasts is most unfavorable upon the individual's health. It is the same that any long-continued discharge produces upon the constitution. The general debility from this cause has been dubbed, in technical language, "tabes lactea." The same condition may be seen in extreme cases of polygalactia and in hyperlactation.

TREATMENT.—The most prominent feature in the accounts of these cases is the stubborn resistance that they offer, as a rule, to treatment. In most of the textbooks on obstetrics it is asserted that there are only two measures which can be depended upon to give relief—firm compres-

¹ Winckel: *Path. u. Therap. des Wochenbetts*, p. 440.

² *Tr. Lond. Obstet. Soc.* for 1887, xxix.

³ Green, quoted by Gibbons, "A Case of Galactorrhœa (unilateral)," *ibid*.

sion of the mammary gland and the administration internally of iodide of potassium. It should be remembered, however, that in many of these cases the milk secretion stops spontaneously with the return of menstruation,¹ and that in a certain proportion of cases a treatment adapted to securing a discharge of blood from the uterus has been successful in curing galactorrhœa. Dr. Routh² warmly advocates Simpson's plan of introducing a piece of caustic within the uterus for securing this result. Dr. Abegg was successful in two instances in stopping the galactorrhœa by the use of warm douches, which brought about a return of the menses. Electricity has been recommended to secure the proper contraction of the sphincter muscles of the lactiferous ducts; but, from what has been said as to the relationship of this condition to galactorrhœa, the use of electricity must prove in the vast majority of cases ineffective. The long-continued administration of ergot has been warmly recommended; the remedy should be tried, for its use seems rational. The experiments of Roehrig³ have demonstrated that those drugs which bring about an increased arterial pressure in the breasts promote milk secretion, while those which lower arterial tension tend to diminish or even abolish the function. Chloral was shown to be peculiarly powerful in diminishing the quantity of milk; therefore this drug is also worthy of a trial. Belladonna internally or as a local external application is usually employed as a routine practice, but it is very doubtful whether it has the slightest good effect. It has been declared that antipyrin in $2\frac{1}{2}$ -gr. doses, three times a day, will diminish milk secretion.⁴ This remedy might be given a trial.

QUALITATIVE ANOMALIES IN THE MILK.

The most important factor, from a practical point of view, in its influence upon the constitution of the milk is the diet. This is a matter which has been very extensively studied in animals: it has not been so fully investigated in the human being. It has been asserted that a fatty diet will diminish the quantity of milk very greatly. A vegetable diet is said to diminish the casein and fat and to increase the sugar. A diet rich in meat will increase the fat and casein, but will diminish the sugar. Dr. Zaleski⁵ has carefully studied an interesting case in which too rich a diet so increased the quantity of the fat that the woman's milk proved injurious to the infant. By regulating the diet, cutting off a large part of the meat and prohibiting the use of beer, the consti-

¹ Gibbon's case; Abegg's cases; in two cases under the care of Depaul the galactorrhœa was arrested by the recurrence of pregnancy.

² Discussion on Gibbon's paper, *loc. cit.*

³ Quoted by Gibbons.

⁴ *Bull. gén. de Thérap.*, June, 1888.

⁵ "Ueber die Einwirkung der Nahrung auf die Zusammensetzung u. Nahrhaftigkeit der Frauennilch," *Berlin. klin. Wochenschr.*, Jan. 23 u. 30, 1888.

tution of the milk was rendered more suitable for the infant's needs. After a careful analysis of the work already done in this field, particularly in animals, Zaleski comes to the following conclusions:

1. That a milk too rich in fat is injurious to the infant.
2. That a rich, luxurious, and too exclusive diet of albuminous substances considerably increases the proportions of fat in a woman's milk, decreases the milk-sugar, and has little influence upon the other constituents. The use of alcohol has, to a certain degree, the same effect.
3. That by a suitable diet and nourishment of the woman the desired—and for the child, in the concrete case, essential—milk constitution can to a certain degree be secured.
4. That the fat of the milk in all probability is manufactured to a great degree directly or indirectly out of the albuminoids of the ingested food.

Decaisne¹ has made an interesting study of the influence exerted by the opposite condition upon the constitution of a mother's milk. In his investigations in Paris during the siege he found that all the solid constituents of the milk were decreased except the albumen, which was increased.

The effect of emotions upon the constitution of the milk has already been referred to. What change profound mental disturbances occasion in the milk has not been exactly made out. That there is some radical alteration which converts this food into a rank poison for the infant there is no room for doubt. Baranger² quotes a good example: A nursing-woman saw her husband threatened by a soldier armed with a sabre. Directly afterward she gave suck to her child. It seized the nipple at first with avidity, then refused it, became violently convulsed, and died. Every practising physician has seen, at least to some degree, examples of the change produced in the milk by mental impressions. Becquerel and Vernois found that under the influence of emotion the milk of a woman contained more water, very much less fat, and somewhat more casein than was found in the mammary gland of the same individual under ordinary circumstances. Almost all acute febrile affections not only diminish the mammary secretion, but produce some change in its constitution and make it indigestible. This is most marked in the prodromal period. If a chill occurs, the lacteal secretion is suspended almost entirely for from twelve to twenty-four hours.

It would seem probable that the germs of some diseases pass from the mother's organism into her milk: this is true undoubtedly of tuberculosis. It would seem likely that the germs of malaria find an exit from the body in this way. There is a carefully-studied case which would point to the possibility, at least, that septic micro-organisms may

¹ *Loc. cit.*

² "Les Contre-indications et Obstacles à l'Allaitement maternel," *Thèse de Paris*, 1884.

be discharged from the breast into the milk, although the mammary gland itself is quite free from inflammation. It was observed by Karlinski:¹ there was fatal infection of the newborn from the milk of a puerpera with fever. In the milk were found staphylococci.

Women under the influence of mercurialism or saturnism excrete milk of abnormal quality, dependent, perhaps, as much upon the anæmia associated with these conditions as upon the excretion of the drug itself. The influence of syphilis upon the constitution of the milk is not yet known. It has been asserted that there is no change in the milk of syphilitic women. Vernois and Beequerel, on the other hand, affirm that there are well-marked alterations in the relative proportions of the different ingredients in the milk from syphilitic women.

Under ordinary circumstances colostrum-corpuscles may be detected in human milk for the first eight or ten days after delivery. There are certain conditions in which a return of these corpuscles may be noted. They reappear sometimes upon the return of menstruation, during acute mastitis, or in any other acute affection during lactation. Of twenty-three examinations made by Truman² to investigate this point, colostrum-corpuscles were found present in the following cases: In a primipara for four weeks after the birth of a premature infant. They were discovered in a woman who was suckling her four-months'-old baby; very few, however, could be detected. They were seen in a non-pregnant woman whose baby, born twenty-six months before, had been weaned for ten months. Another interesting case was that of a woman who had been married three and a half years. She had never been pregnant; ever since marriage, for a week before menstruation, the breast filled with milk. In this fluid there were colostrum-corpuscles. Another instance was that of a nursing-woman who had never been able to use her right breast during lactation. Her last child was twelve months old. In the milk which could be squeezed out of the right breast colostrum-corpuscles were discovered. Another case was one of chronic ovaritis. Twenty-three months had elapsed since the last labor, and eleven since weaning. The milk which exuded from the breast contained colostrum-corpuscles. In the breast of a woman fifty-six years old which was removed for carcinoma about a teaspoonful of milk was found, very rich in colostrum-corpuscles. This woman's youngest child was eight years old. In a case of galactorrhœa which had persisted for four years these bodies were also discovered. This fact is important, particularly from a medico-legal point of view, for it has been asserted that the presence of colostrum-corpuscles in the milk proved a recent delivery—an assertion by no means justified in fact.

¹ "Zur Aetiologie der Puerperal infektion der Neugeborenen," *Wien. med. Wochenschr.*, 1888.

² *Br. Med. Journ.*, 1888, ii. p. 947.

RELAXATION OF THE PELVIC JOINTS.

The pelvic joints may after labor be the seat of inflammation, accompanied by serious exudation and ending possibly in suppuration. This, however, is but one of the many manifestations of septic infection. The pelvic joints may be ruptured by violence during labor. This is considered in connection with the forceps operation and injuries to the woman in labor. Finally, there may be, to a marked degree, relaxation of the pelvic joints, much exaggerated beyond that seen in almost every pregnant woman, and persisting for varying periods after delivery.

The ETIOLOGY is most obscure. Abnormal motion in the pelvic bones may be met with frequently in pelves of more than normal size: it has been noted after abortion. It may be traced to a large, hard foetal head which has distended the joints. It has been ascribed to obesity, to a cachectic condition, to sudden and powerful exertion in the latter months of pregnancy, to an unusually great circumference of the pregnant uterus.¹

The DIAGNOSIS is easy. There is difficult locomotion, unusual mobility in the joints, especially the symphysis pubis, and localized pain.

The TREATMENT should consist in the application of some kind of firm binder about the hips. Tonic remedies are often required. In the course of a few weeks the joints usually regain their firmness. In some cases the relaxation persists for months.

¹ Winckel: *Geburtshülfe*, p. 873.

INSANITY AND DISEASES OF THE NERVOUS SYSTEM IN THE CHILD-BEARING WOMAN.

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I. PUERPERAL INSANITY AND THE INSANITY OF PREGNANCY AND LACTATION.

DEFINITION.—The terms “puerperal insanity” and “puerperal mania” have been used by most writers both in a generic and a specific sense; but as this double use of a scientific term leads to a confusion of things which are quite distinct, although similar, it is desirable to clear away at once the ambiguity which surrounds both of these expressions. In its generic sense the phrase “puerperal insanity” has been loosely given to all the various mental diseases which assail the childbearing woman from the moment of conception to the end of lactation, while it has been given specifically to the two or three forms of alienation which make their appearance immediately or soon after parturition, and which owe to that physiological process their origin and whatever special symptoms they may possess. It is obvious that this latter or specific use of the term is the only exact one, and that the mental disturbances which precede and follow the puerperium may be appropriately named the insanity of pregnancy and the insanity of lactation, respectively. Again, the term “puerperal *mania*” has been indiscriminately applied to all cases, whereas a quite large proportion of them are melancholy, and not maniacal: therefore this word ought to be strictly limited to its proper special use, as it will be in this article. In spite of the fact that custom has sanctioned the double use of the term puerperal insanity, and that no better general term is suggested to include these three epochs, I have thought best to limit the phrase to its legitimate special use after this brief explanation, and with the understanding that this article covers the three periods referred to, and is intended to include all the various forms of insanity which may appear in them.

The mental diseases which accompany or follow pregnancy, parturition, and lactation do not present such special and distinct symptoms as would justify erecting them into a class by themselves, as far as their

form is concerned ; in other words, the mania which is excited by parturition and the melancholia which follows prolonged lactation are not specially different, if we except perhaps some few minor details, from the mania and melancholia which arise under other circumstances. "There is no peculiarity," says Prichard, "in the phenomena of puerperal madness by which this disease is distinguished from other examples of insanity." Hence those who adopt a classification of insanity based upon its clinical forms do not admit the so-called puerperal insanity as a distinct disease ; but, on the other hand, they accord to these three states—pregnancy, the puerperium, and lactation—their due importance as *causes* which may excite various mental disorders. This is especially true of the German writers, Kraft-Ebing,¹ Schuele,² and Kraepelin,³ who treat of these disorders rather briefly from the etiological standpoint, and do not describe them as distinct clinical forms. Spitzka⁴ also, who has adopted a modification of Kraft-Ebing's classification, does not admit the puerperal forms of insanity to full membership in his groups, but prefers to designate them as the *mania in puerperio* and the *melancholia ex lactatione*, thus indicating that he recognizes nothing distinct in them but their etiological relations. In the present state of our knowledge of insanity this clinical method of classification of the Germans is undoubtedly the most complete and satisfactory, and cannot be wisely ignored by any writer of systematized psychiatry. It is just as true, however, that it may be necessary sometimes to study a disease or series of diseases from the standpoint of their causation under certain distinct circumstances and in reference to prognosis and to certain special relations, as well as with a view to treatment and prevention ; and it is from this view of the subject that it must appear pre-eminently proper that the various important, and always appalling, insanities of these three periods should be discussed in a system of obstetrics.

HISTORY.—The disorders of mind in pregnant and parturient women fix the attention and excite the sympathy and imagination to so marked a degree that it cannot be wondered that the early literature of different races contains some reference to them. The peculiar impressibility of the nervous system of the female sex, and its supposed dependence for its peculiarities upon the womb and its appendages, have been, even to modern times, the fruitful source of speculative theories in neuro-pathology. Hysteria has claimed the great mass of this speculative wisdom for her own, and is in fact, to some extent, the creature of it. But pregnancy and childbirth have, with more reason, been recognized as the potent factors in many profound and enduring changes acting especially through the cerebro-spinal sys-

¹ *Lehrbuch der Psychiatrie.*

² *Psychiatrie.*

³ *Klinische Psychiatrie.*

⁴ *Manual of Insanity.*

tem. The wife of Phineas, when about to be delivered, could not withstand the shock produced by the defeat and death of her husband, which soon deprived her of reason and of life. The fable of the insane Proetides, who spread their mental contagion to unhappy mothers, so that these killed their offspring and fled into the wilderness, perhaps symbolizes in an archaic form the perversion of the maternal instinct which sometimes accompanies puerperal mania. Under the ancient Athenian laws the house of a woman pregnant or just delivered was guarded so jealously against intrusion that a murderer could not be seized who sought refuge there; and the Romans suspended a crown at the house of the confined to indicate that it was a sacred asylum. The early medical classics have distinct references to this subject, of whom we can mention Hippocrates¹ and Galen. Among the early moderns, who reflect antiquity, Sydenham discourses at some length on this theme in his well-known epistle on the Hysterical Diseases, and gives the details of a fatal case. In 1705, Schultzius² wrote a Latin dissertation on the subject in which he defines the disease concisely: "Melancholia ex utero, with which the puerperal woman may be seized some days after the birth of her child, is characterized by delirium, or a perversion of the imagination, and sometimes of reason, without fever and fury, with apprehension and sadness and various other symptoms." Berger³ published at Göttingen in 1745 a small pamphlet on the mania and melancholia of puerperal women, in which he calls especial attention to the fact that abortion may be followed by "these deliria." This publication could not have attracted much attention, and must soon have become rare, for Esquirol complains that he had never been able to find it. This serves to show with what little appreciation the systematic treatment of the subject has been received in comparatively recent times. Puzos,⁴ in his treatise on obstetrics in 1759, has several papers on so-called "lacteal deposits," to which accumulations in the brain he attributes dementia or insanity. Sauvages⁵ in 1771 included in his elaborate system the "paraphrosyne" of women just confined. Haslam in 1798 referred to 80 cases which he had observed in Bethlem Hospital. Rush⁶ in the early part of this century refers to the disease with that perspicuity and depth which always put him a generation ahead of his time. Scattered references are found in recent writers to the meagre, and often fanciful, ideas of various well-known but now neglected authorities of a century ago,

¹ *Works*, translated by Adams.

² *Disputatio Inauguralis de Melancholia ex Utero, in Puerpera Observata et Curata, etc.*, 1705.

³ *Dissertatio de Puerperarum Mania et Melancholia, etc.*, Gottingæ, 1745.

⁴ "Troisième mémoire sur les dépôts laiteux," *Traité des Accouchemens à Paris*, 1759.

⁵ *Nosologie méthodique, etc.*, traduite du Latin, etc., 1771.

⁶ "Letter to Dr. John Spence," etc., *Philæ. Med. Museum*, 1808, iv., No. iii. p. 129.

but many of these references I have not had the opportunity or inclination to explore. Thus the subject remained without orderly treatment, except for the brief and scholastic Latin essays already referred to, until Esquirol¹ wrote his paper on the insanity of pregnant and parturient women about the year 1818. This paper, it is not too much to say, arranged this subject permanently, and left it ready to the hands of almost all subsequent writers, who seem to have been content to acknowledge the originality and to follow in the footsteps of this great master. In 1820, Gooch,² an eminent obstetrician of London, published his observations on puerperal insanity, which have among their merits the record of a very interesting case; and a few years later (1828) Burrows printed in his *Commentaries* an extensive chapter, with statistics, on the subject. Before 1845, Priehard wrote for the English *Cyclopædia of Medicine* the article on insanity, in which he treats of puerperal madness separately and fully. In 1851, Ideler³ wrote in German upon the "*Vesania Puerperalis*." In the same year Weill wrote a dissertation on the subject.⁴ In 1858, Marcé⁵ published in Paris his monograph on these various forms of insanity, which is by far the most complete and learned work on the subject that has ever appeared. The last complete treatise on puerperal insanity of which I have knowledge is by Rocher⁶ of Paris, who wrote his thesis for the doctorate on this theme, and gives a very complete review and bibliography. The systematic treatises on insanity give more or less attention to it, Clouston⁷ especially devoting a separate chapter to it as a distinct affection. Morel,⁸ Guislain,⁹ and Griesinger¹⁰ refer to the etiological importance of the puerperal state, but do not recognize the disease as distinct. Statistical papers have been contributed by Reid,¹¹ Tuke,¹² Webster, Schmidt,¹³ Leubben,¹⁴ Ripping, Boyd,¹⁵ McLeod,¹⁶ and Clark. The systematic works on obstetrics for the last forty years have more or less complete reference to the subject of "puerperal mania," but show a wonderful unanimity in falling back upon the writings of Esquirol, Gooch, and, later, Marcé.¹⁷

¹ *Des Maladies mentales, etc.*, Paris, 1838.

² *Trans. Col. Phys.*, London, 1820.

³ *Charité Ann.*, ii. f., 1851, p. 122.

⁴ *Diss.*, Strasbourg, 1851.

⁵ *Traité de la Folie des Femmes enceintes, etc.*

⁶ *Étude sur la Folie puerpérale*, Paris, 1877.

⁷ *Clinical Lectures on Mental Diseases*, Phila., 1884.

⁸ *Traité théorique et pratique des Maladies mentales*, Paris, 1852.

⁹ *Leçons orales*.

¹⁰ *Mental Pathology and Therapeutics*, translated by Robertson and Rutherford.

¹¹ *Journ. Psych. Med.*, 1848.

¹² *Ed. Med. Journ.*, May, 1865.

¹³ *Beitr. zur Kenntniss der puerperal. Psychosen*, Berlin, 1880.

¹⁴ *Zur Stat. der puerperal. Psychosen*, Halle, 1872.

¹⁵ *Journ. Ment. Sci.*, July, 1870.

¹⁶ *Brit. Med. Journ.*, 1886, ii. p. 239.

¹⁷ The *Index-Catalogue* of the Surgeon-General's Library supplies an extensive bibliography upon this, as upon every other, subject.

FREQUENCY.—The statistical method of study has been applied by a large number of writers to the insanities of pregnancy, parturition, and lactation, so that it would be quite easy to prepare a very elaborate table or series of tables presenting these subjects from all possible points of view. Some of these statistics are not without interest and value, and a brief summary of them is presented below; but the results obtained by different statisticians vary so widely that they will only confirm the opinions of those who attach to this method little importance. This variation is most marked in reference to the frequency of these diseases relative to the total number of female insane, the extremes being, on the one hand, 21 per cent., and on the other less than 1 per cent. A little reflection will show why these results vary and why they are often of such little value. The method existing in many asylums of tabulating all cases according to their supposed causes is a very defective one. Insanity is usually due to a complexus of causes, involving heredity and remote antecedents and relations; and this is not the less true of the so-called puerperal forms than of other classes. It is not enough to simply say that a case is puerperal because the patient has recently borne a child or endured an exhaustive lactation; and yet who can doubt that many of these cases have been entered somewhat according to the caprice, often after imperfect observation, of those whose function it may have been to receive them? Here at once is a source of error. Another error is due to social conditions. Asylums which receive their patients from the poorer classes probably have a different story to tell from those which receive the rich and prosperous. This is true especially as to the prognosis of cases, and explains why cases from the Salpêtrière, for instance, give less promise than those from some other hospitals. There are no doubt a large number of puerperal insane cases, especially among the better classes, which do not go to asylums at all, their families preferring, in view of a hopeful prognosis, to endure the anxiety and burden of nursing them at home, rather than have the patients incur the dreaded stigma which unfortunately and unjustly attaches to asylum cases.

The frequency of mental diseases in childbearing women may be studied, first, with reference to the total number of the female insane; and, second, to the total number of childbirths.

The following list includes almost all of the older observers, and presents some surprising differences, as may be seen. It refers to the number of puerperal cases occurring in all female insane, and is compiled from some of the largest European asylums:

Haslam, of 1644 insane cases, gives	84	puerperal insane.
Reid (1), " 899 " " "	111	" "
Reid (2), " 703 " " "	37	" "
Palmer, " 467 " " "	19	" "

Thurnam,	of	246	insane	cases	gives	11	puerperal	insane.
Charenton,	"	256	"	"	"	10	"	"
Cork,	"	255	"	"	"	34	"	"
Webster,	"	1091	"	"	"	131	"	"
Esquirol (1),	"	1119	"	"	"	92	"	"
Macdonald,	"	691	"	"	"	49	"	"
Esquirol (2),	"	144	"	"	"	21	"	"
Guislain,	"	144	"	"	"	1	"	"
Leubben,	"	1184	"	"	"	181	"	"
		8843				781		

This gives an average of 8.83 per cent. If the exceedingly low percentage of Guislain is deducted, the average is raised not quite 1 per cent. higher. In this table Haslam gives about 5 per cent., the asylum of Charenton about 4 per cent., and Leubben about 15 per cent. These discrepancies can scarcely be explained by local differences, and must be due to errors in some of the reports.

Schmidt gives the following table of percentages from more recent observers, including Leubben:

Leubben (Halle),	15.3	per cent.
Fürster (Charité),	16.8	" "
Ripping (Siegburg),	21.6	" "
Schmidt,	17.3	" "

Some of these results cannot be explained except by peculiar circumstances which must characterize the institutions from which the statistics are taken. It is possible among the poorer and more vicious classes of large cities, where illegitimacy and privation can sometimes make of pregnancy a veritable scourge, that one case of insanity in five may be connected in a more or less remote degree with childbearing, but this proportion certainly cannot hold among all classes the world over. These figures suggest again the error of attributing to one cause too exclusively the various diseases of the mind, and excite the doubt whether other important factors may not be omitted in such an inquiry. Marcé, who has made a careful study of statistics, draws the conclusion that there is 1 case of "puerperal insanity" among 12 or 13 cases of all insane women: this is about 8 per cent. The Pennsylvania Hospital for the Insane has admitted during almost a half century 4442 insane females, of whom 360 are attributed to the puerperium and lactation. This large institution draws from the more affluent classes of the whole United States. Its percentage is also about 8. The Norristown Asylum, Pa., attributes 141 of its 2100 insane females to childbearing—about 7 per cent. The records of the Philadelphia Hospital unfortunately have not been preserved in past years so as to be available for this inquiry. Tuke's statistics, taken from Morning-side Asylum, give 155 cases of "puerperal insanity" among 2181

insane females—7.1 per cent. From these various figures it appears that of all hospital cases about 8 out of every 100 females are cases with a history of recent childbirth or lactation, to which is probably partly due, either as a predisposing or exciting cause, the existence of the mental maladies of these patients.

Obstetricians will naturally be more interested in the second inquiry—the frequency of mental diseases relative to the total number of confinements. It is not possible to present statistics which are entirely reliable. The attempt to prepare such tables has been made by several authors. Reid gives the statistics of several lying-in hospitals, as follows:

Westminster	= 3500 labors, 9 cases of insanity.
Queen Charlotte's	= 2000 labors, 11 cases of insanity.
St. Giles	= 2838 labors, 1 case of insanity.

Here, again, are obviously several sources of error or difference. The large percentage of the Queen Charlotte's Hospital is attributed to the fact that this institution received a larger number of illegitimate pregnancies than the others.

MacLeod has recently made some calculations as follows:

Years 1878 to 1882: births registered in England and Wales,	3,537,580
(Which includes plural births, estimated)	37,580
	<hr/> 3,500,000
From Lunacy Com. Reports there were admitted into asylums	
in England and Wales in these years, of puerperal insanities,	1,794 cases.

This gives a proportion of 1 case of insanity to 1950 labors. The errors are very great in this estimate, due to the fact that many cases of puerperal insanity are not sent into asylums.

MacLeod further calculates:

Reid's statistics	Labors	8338
	Insane cases	21
		= 1 to 397
Rigden's "	Labors	6000
	Insane cases	5
		= 1 to 1200
MacLeod (various sources)	Labors	11,940
	Insane cases	30
		= 1 to 398

These three estimates give 1 case of mental disorder to 469 cases of labor, and no doubt include pregnancy and lactation. Rigden's table varies widely from the others, and probably makes the average number of insane cases too low. It is noticeable that Reid's and MacLeod's results are almost identical, so that the average of 1 case in about 400 labors is probably as nearly correct as can be obtained.

CAUSES.—In no department of medical inquiry are there found such a diversity of opinions and such looseness of thought as in the etiology of disease; and this is so of the subject now under consideration. This is probably partly due to the fact that many persons lose sight of the principle—or have never learned it—that it is not within the power of the human mind to apprehend the essential action of causes, and that, therefore, being able to recognize the simple fact only that some things follow others in a regular sequence, they come to assign as causative those things which are often only precedent or coincident. This has several striking illustrations in the history of the mental diseases attending the various stages of childbearing and lactation. It does not by any means follow, as has been already stated, that the so-called puerperal insanities, or at least many cases of them, are due entirely to pregnancy, parturition, and lactation, and some of them are probably only indirectly connected with these states. Even in the cases where the causation can be most unerringly traced to these states (and such cases are the most numerous) it does not follow that there are no other important factors making up an etiological group. So, too, of certain phenomena which are really symptoms of these diseases, and yet which were formerly almost constantly mistaken for causes of them. The milk and lochia especially have been regarded with suspicion. Hippocrates says: “In women blood collected in the breasts indicates madness.” Van Rossum (quoted by Marcé), supporting this opinion of Hippocrates, says that Pieters had seen a woman recently delivered giving blood from her breasts instead of milk. Planchon, he says, gives a similar case dying of a gangrenous tumor of the leg (blood-poisoning?). Galen says: “The blood accumulates in the breast, and cannot be converted into milk; and because of the connection existing between the mammæ and the brain the vapors—burning or scalding—mount to the latter and mania occurs.” Puzos has written of lacteal deposits or “*dépôts*.” He says that when the milk does not follow the natural routes it may be determined toward the brain, and that the most ordinary effect of a lacteal deposit upon the brain is to produce dementia or insanity. “In spite of the dark veil which keeps from our eyes the mechanism of the brain for exciting the diverse movements of the soul, when the milk comes to deposit itself upon that organ it is able by the engorgement which it causes to compress firmly some one of these parts or to stretch the fibres to a degree of excessive tension: this compression, which produces an obstacle to the mechanical action of the brain, produces dementia; and the excessive tension of the fibres, rendering this same action too lively, causes insanity.” Esquirol himself was still somewhat under the influence of the old ideas, for he speaks of “the ravages which the milk commits in the economy.” Again, Hippocrates says that the lochia are carried to the head and cause maniacal transports:

this was in keeping with the humoral pathology which afterward dominated the medical world. Sydenham thinks that the suppression of the lochial flow is the cause of madness. Levret¹ has a chapter on the "apoplexie lactense," which no doubt signifies in part these mental states, and dwells upon the suppression of the milk and lochia. Berger enlarges to some extent upon these ideas. Some of these authors have probably mistaken pus for milk, as they speak of finding milk post-mortem in the brain and abdomen. Even Esquirol gravely tells us that he has found serum "among the folds of the arachnoid membrane, but never anything that resembled milk." It is needless to say that the suppression of the milk and lochia—which does not occur in *all* cases—is a result rather than a cause of the general physical and mental disturbances in the puerperal and allied insanities.

Among other causes of doubtful import may be mentioned the sex of the child, the use of chloroform, mammary and other abscesses, and albuminuria. These may be classed among other coincidents or results. Esquirol speaks of a patient who always became insane after bearing a male, and was always exempt after bearing a female child! It would certainly require a wide study of statistics to throw even a doubtful light upon the etiological significance of the sex of the child; and I am not aware that this has been made. In the present day, when anæsthesia is so universally used in minor surgery and uncomplicated obstetrics, it is difficult perhaps to conceive how it could be made to suffer the opprobrium of causing puerperal insanity; and yet the literature of the early days of chloroform proves beyond doubt that it was so accused, and sometimes with great injustice and acrimony. Webster² relates 5 cases (4 of mania and 1 of loss of memory) following the use of chloroform in parturition. The details are very meagre, the argument being little more than *post hoc, ergo propter hoc*. The query does arise, however, whether this was not rather a moral than a physical cause due to the novelty and the unusual dread experienced by the patients in taking such a mysterious and perhaps dangerous substance. The writer has frequently heard of a case—and has known personally many connected with it—where chloroform was given to a lady in her confinement about the time of its first introduction into practice. Her pregnancy had been noted for many peculiarities and changes in disposition, and her labor was followed by mania; and yet the ignorance and prejudice of her family were so great that they attributed her misfortune to the anæsthetic, and for many years blamed with injustice the physician who administered the chloroform at the patient's urgent demand. Simpson,³ who championed the advent of chloroform, reported

¹ *L'Art des Accouchemens, etc.*, Paris, 1726.

² *Journ. Psych. Med.*, 1850, p. 269.

³ *An. Med. Psychol.*, 1853, p. 691 (extract).

to the Edinburgh Obstetrical Society three cases in which it was thought that puerperal mania had been *averted* by anæsthesia, but his conclusions as to its prophylactic action have not been generally accepted. I think there can be no doubt, however, that in the transitory mania which sometimes accompanies the crisis of labor, and which may in some cases leave an enduring unwholesome impress upon the mind, the use of ether and the forceps is imperatively demanded at once. Mammary and other abscesses have been classed among the causes of mental disorder in childbed. The effect of simple abscess of the breast can be very slight unless associated with a decided anæmic state of the blood, which it would tend to continue or aggravate, and so promote nutritional disorders of the brain. The existence of abscesses in other parts of the body may be an evidence of septic or pyæmic infection of the blood, which is in some cases of great importance in causing stuporous or delirious mental states, and which will be presently referred to. The relation of albuminuria to puerperal mania first attracted the attention of Simpson of Edinburgh, who published a paper¹ with meagre details of four cases. The albumen appeared at or about the commencement of the attack. In one of these cases convulsions occurred before the delivery. The albuminuria passed away before the restoration of mental powers. Donkin² supported the opinion of Simpson on this subject, but based his paper on the observation of only one case—that of a woman delivered of twins who had œdema and albumen the day after, then soon became maniacal with hallucinations of the senses, and continued so for about seventeen days. The appearance of albumen and the diminished elimination of urea in the urine of patients with puerperal insanity are of importance, as tending to throw some light upon the disorders of nutrition and excretion which accompany, and even help to cause, this disorder. It ought, therefore, to be watched for in all cases. In our present knowledge, however, albuminuria, or the malnutrition which it indicates, cannot be accepted as a sole cause of these mental disorders. It is worth while to state, however, that several cases of prolonged insanity following puerperal convulsions have been reported by various writers,³ in addition to the one by Simpson. Tuke is inclined to adopt Simpson's view.

The history of a previous attack of insanity, whether puerperal or not, ought always to suggest to the obstetrician the possibility of its recurrence, and forewarn him to meet all contingencies, such as depressing moral or physical states, which might predispose to it. The effect of pregnancy and childbirth upon women already insane will be briefly considered later. Some writers have regarded the first menstruation

¹ *Ed. Med. Journ.*, vol. ii. p. 761.

² *Ibid.*, May, 1863, p. 994.

³ See Marcé, *op. cit.*

after confinement as a critical period, but it seems very doubtful whether it has any real influence in curing a case already established or in exciting the disease in one predisposed. In the one instance it may be regarded as a sign of the restoration of the normal functions of the body, which carries with it renewed mental health; and in the other, if it has any significance, it is probably due to increased anæmia and asthenia caused by an excessive flow of blood.

The causes which undoubtedly act in the most direct and uniform way to produce disorders of mind in pregnancy, childbed, and lactation can be arranged under four heads—heredity, moral impressions, anæmia, and septic conditions. The relative importance of these groups of causes cannot be succinctly stated: they have varying influence, and are combined in individual cases in various degrees. Neither do they always throw light upon the pathogenesis of the disease, although some writers appear always to confound this subject with etiology. Clouston relates a case which shows very clearly the effects of a combination of causes. A young married woman whose sister and aunt had been insane, and who had borne four dead children in rapid succession, was delivered at seven months by the induction of premature labor because of a deformed pelvis. On the second day she began to have hallucinations of sight and delusions that people slandered her, and became wildly maniacal in paroxysms. There was extreme prostration, with a temperature as high as 102° . Pneumonia at the base of both lungs came on, and the patient died. The autopsy revealed an intensely congested brain, hepatized lungs, pus on the peritoneal surface of the womb, a small abscess in the right ovary, remains of purulent adherent placenta, and a uterine vein filled with pus. Clouston thinks that this case was one of puerperal fever with maniacal delirium, rather than a case of “puerperal insanity” with septicæmia; and the distinction may pass. The important point to note is that there were in the case the combined causes of heredity, over-childbearing, dystocia, and septic infection, and that if the latter had even stopped short of taking the patient’s life, she would probably have continued in a more or less prolonged insanity. The writer saw in consultation nearly three years ago a woman aged forty-two who had been delivered a month previous of her ninth child. Her maternal grandfather had been insane. She was in moderate circumstances and weighted with the care of a very large family. For a year she had been wakeful and nervous, and had had complete loss of appetite with vomiting of food. She was consequently in a very anæmic state when her last child was born. After her labor she had had much abdominal soreness and a high temperature. When seen she was in a typhoid delirious state, excitable at times beyond control in her own home. She was sent to the Pennsylvania Hospital for the Insane, where she still continues, having passed through

various stages of delirium, melancholia with delusions and hallucinations, and much weakness of mind or dementia, but with a slow tendency to restore her shattered mental fabric, until she is now almost recovered. In this case there was the effect of a combination of causes, prominent among them being over-childbearing, anæmia, and sepsis, acting in conjunction with an hereditary predisposition.

No one can study the statistics of puerperal and allied insanities and not be impressed with the importance of heredity as a predisposing cause of these disorders. Schmidt reports 283 cases with an hereditary history in 102, or 35.8 per cent., and again 964 cases with an hereditary history in 386, or 40 per cent. The following table presents the results of other observers:

Macdonald	in 66 cases of "puerperal insanity" found 17 hereditary.
Reid	" 111 " " " " " 45 "
Leubben	" 181 " " " " " 55 "
Stephansfeld	" 30 " " " " " 14 "
Webster	" 131 " " " " " 51 "
Total,	519 182
About 35 per cent.	

These percentages would no doubt be raised if it were possible to elicit a full family history in all cases. The difficulties attending such an inquiry are twofold: first, the ignorance which many persons have of their family histories; and, second, the skill and perversity with which they or their friends will conceal or distort facts which prove a family history of insanity.

As to the more obscure questions involved in heredity, the evidence of it in morphological and other somatic states or alterations, as influencing these and all other forms of insanity, this is not the place to enter into a prolonged discussion, especially as much is still unknown or only partially revealed, and the subject involves too wide an inquiry to be included in this special study. It is sufficient for our purpose to indicate that about 35 per cent. of these cases have an acknowledged family history of insanity.

The moral state during pregnancy and parturition is deserving of careful observation and study as contributing to the causation of mental disorders. It does not come within the range of the microscope, nor is it revealed by the mechanical methods which prevail in the modern clinic, and therefore it may suffer some risk of incurring disfavor, for there are even those who write especially on this subject who affect to ignore it. But it appeals strongly to the philosophic sense of those who attempt to study disorders of the mind from a psychological as well as from a merely physical standpoint, and has been regarded as of paramount importance by the most eminent authorities, such as

Esquirol and Griesinger. "The psychology of pregnancy," says one very acute observer, "has yet to be written in a scientific way." It is a matter of common observation that few women carry a child to full term without showing some mental changes. These alterations are most frequently of temperament and disposition, or are shown by whims, caprices, and unusual or bizarre tastes and desires. The lower centres of the nervous system share often in these disorders, a certain instability both of the motor and sensorial functions being noted, involving sometimes derangements of the great viscera. Pregnancy tries the endurance and pose, as it were, of the mind—its capacity to face privation, discomfort, danger, and, in the case of the primiparous woman, unknown and exaggerated horrors. In no walk of life, where great cares of business or of state have at least their compensation, in no scene of action or danger, where applause and heroism have their stimulation and reward, can there be found a more dismal and alarming conflict than that which in her imagination presents itself to the youthful, delicate, and untried woman when, alone and to a great extent unaided, she first faces the inevitable hour. With the rumors and traditions which her curiosity has gathered in since first she learned the secret of generation, she endures the anxious suspense of many weary months of waiting, while during this period she often suffers much physical discomfort, and sometimes serious nutritional change. That this should affect her imagination, depress her spirits to the verge of melancholy, and even sometimes jeopardize her reason, will not be wondered at, I think, by those who engage extensively in obstetric practice. That to some degree these mental affections do occur very frequently, and not exclusively in primiparæ, will be equally allowed. If this psychic condition finds a soil predisposed by heredity and prepared by anæmia, a painful and protracted labor, or the loss of the child, or still more poisoned by any septic infection, the wonder is still less that in a certain proportion of these unfortunates grave mental disease results. The proportion of primiparæ among those who suffer with simple acute mania is shown by statistics to be large; and this preponderance is no doubt due in part to the mental and moral alterations which are peculiar to, or more marked in, the first pregnancy.

Fordyce Barker¹ has recorded a curious experience. He has seen thirteen cases of puerperal insanity in the wives of physicians—all but one of them primiparæ—and attributes the fact to their reading their husbands' books on obstetrics! The statistics of Morningside Asylum show that about one-third of all puerperal cases occur in primiparæ; which is, of course, as Clouston says, out of all proportion to the number of first confinements in the population.

In multiparæ, however, the case is sometimes not much better. For

¹ *Puerperal Diseases*, Lect. x.

while the sense of personal danger is often less in them, it is by no means always absent; and the writer is sure that he has seen it exist in some to as morbid an extent as in their more inexperienced sisters, while they have in addition to support, not infrequently, the cares, vexations, and anxiety which too many children and too limited means impose, especially upon so many worn-down women, to whom, in the logic of events, domestic life has become a servitude and childbearing worse than a disease. In some of these cases it does seem that melancholia is the normal reaction of the mind to its environment, and mania only a consistent though incoherent protest against this procreation of unhealthy seed. This is no pessimistic view. The privileges, charms, and duties of maternity need no apologist, but a defence is certainly to be allowed to the suffering women who daily exemplify the primeval curse that in sorrow they shall bring forth children.

The effect of moral influences is shown also in cases of illegitimacy. Esquirol in his early paper noted this effect, and had especial opportunities to observe it in a hospital which received the poor and abandoned cases of Paris. Clouston found about 25 per cent. of his cases to be illegitimate, whereas the average rate of illegitimacy of Edinburgh—from which city and neighborhood many of his patients probably came—is about one-third of this. These figures are significant, and confirm the truth of the observations which many have made upon the deplorable effect of seduction upon susceptible minds. This effect is sometimes seen even when the guilty indulgence is not followed by pregnancy. The writer knew of a case of a very respectable girl whose secret might have remained for ever her own, but who confessed her trouble to her medical adviser, became profoundly and morbidly melancholy, and committed suicide. This effect will of course be much more likely to follow in cases of illegal pregnancy, where the apprehension of publicity, the shame, the dread of that cruel social verdict which renders life worse than death, prey upon the mind for months; and in addition the care, the moral support, and physical comforts, which the puerperous woman especially so often needs, are not only not enjoyed, but shunned as making necessary the dreaded exposure. “If puerperal insanity,” says Ideler, “under most favorable circumstances is not hard to explain from psychological causes, it is not difficult to conceive its occurrence in the pitiable martyrs of sexual lust;” and he quotes the words of Lessing, that the person who does not lose the mind under certain circumstances has none to lose. Some writers do not attach the importance to this subject which it seems indubitably to merit; and it is but fair to say that statistics vary and are open to criticism. The Norristown Asylum has treated 112 cases of the insanities of pregnancy, parturition, and lactation, and *not one* of these women was unmarried. This hospital draws largely from the rural districts of Pennsylvania,

where the rate of illegitimacy must be very much less than in large European cities. Morel¹ says that he believes that puerperal mania seizes the virtuous mothers of families more frequently than the women who, especially in Paris, find to such an extent the means of concealing their shame and relieving themselves of the fruits of their criminal loves; and the rest of the world will probably agree with him as to the exemption of the Parisian courtesan.

Impoverishment of the blood is a not infrequent condition accompanying pregnancy, childbirth, and lactation. That it is often a very active cause in the production of mental disorder there can be no doubt. As far as personal experience goes, based both upon obstetric practice and ample opportunity to study all forms of insanity, I have never yet seen one of these cases of puerperal and allied insanity that has not helped to confirm this impression; and it seems probable that to this fact is to be ascribed the favorable termination of so many of these cases, because this potent factor in the causation can often be so successfully treated and overcome. This impression is based rather upon general observation than upon minute examination of the constituents of the blood. I believe, of course, that such minute examination ought always to be made, as throwing light upon causation and furnishing hints for treatment. A few original observations are recorded in this paper.

Pregnancy and parturition are sometimes productive of a grave form of anæmia, as observed originally by Channing and Gusserow.² It occurs especially after delivery, and has been included in the group of progressive pernicious anæmias. In this dyscrasia the number of red blood-corpuscles is greatly reduced, far beyond what occurs in the most severe hemorrhage or in the most exhausting diseases, such as cancer and phthisis. The normal supply of red corpuscles is about 5,000,000 to the cubic millimeter, but in this form of anæmia the number may fall to 1,000,000 or even as low as 300,000. The hæmoglobin is also greatly reduced. Eichhorst collected the reports of 91 cases of pernicious anæmia, of which 19 developed during pregnancy and 10 after delivery.

It is in obstetric practice especially that this tendency to blood-impairment in the childbearing and nursing woman is seen, and is very often to be noted, of course, in women who do not lose their reason. Very many women can withstand for the necessary time the drain upon the system which these conditions entail, but in the occasional case where, as before stated, a variety of causes act together and favorably, the anæmic condition may be the immediate predisposing one. Kraft-

¹ *Traité theor. et prat. des Maladies mentales*, Paris, 1852, vol. i. p. 106.

² See Osler's art. on "Progressive Pernicious Anæmia," *Am. Syst. of Med.* Laveran and Teissier, *Pathologie médicale*, art. "Anémie," vol. i. p. 347, have an extensive bibliography on the subject.

Ebling quotes Ripping and Schmidt as proving that diminution of weight has an influence, and that the psychosis disappears with the return of body-weight. The consensus of opinion among writers is that the physical state accompanying the mental diseases of these three periods is anæmic. The causes which in turn produce anæmia in childbearing and nursing women are various. Prominent among them is the constant drain upon the system of supporting the new life. This appears to act more upon the nursing than upon the pregnant woman, nature often causing a compensatory plethora, as it were, in pregnancy, which is not the case during lactation. I should say that of the relative occurrence of moral and anæmic causes, the former were more frequent before childbirth, and the latter during lactation. Anæmia and altered blood-states are not absent, however, in all cases during pregnancy; and the cases which develop puerperal mania are probably, in large proportion, some of those which have had such alterations in the blood. In this connection it may be well to call attention again to Simpson's view, that albuminuria is present in some of these cases, and that a number of authors have reported insanity following eclampsia. I once delivered a young primipara who had had frequent vomiting and loss of appetite, albuminuria, and œdema of the feet, with some visual hallucinations, and who went into premature labor at the end of the eighth month. She had no convulsions and rather an easy labor, but the child, unfortunately, was very feeble and lived but a few hours. This patient became abnormally melancholy for a time, and changed in her disposition toward relatives, and was quite morbid about her child. Her case exhibited, fortunately, only the transient effect of these causes.

Flooding after labor has been noted in a certain number of cases, and can be a cause of an anæmic basis for insanity. The practice of free bleeding for puerperal convulsions cannot be ignored in connection with mental disorders following eclampsia; and one writer is confident that in a case observed by him the anæmia so produced had as much to do with the insanity as the nerve-storm through which the patient had passed.

The relation of septic infection to the causation of mental disorders in the puerperium is a question of very great interest and importance, about which, unfortunately, we have not very certain and accurate knowledge. From some clinical experience, however, and a somewhat extended study of both the older and more recent observers, I am convinced that this relation is often intimate, and ought always to be suspected and guarded against. The knowledge which we have of septic infection in all conditions is, most of it, comparatively modern; and this knowledge has been extended and systematized at so recent a day that there is little wonder that so little light has been shed upon this phase of it. A partial survey of the literature of this subject

reveals the fact that a more or less distinct variety of puerperal mania has been recognized from a very early date; and the description given of this peculiar variety by those who record original observations leads to the belief that it owed its distinctive symptoms to septic infection. Hippocrates¹ relates the case of a woman who had brought forth twins. Her symptoms were suppressed lochia, chills and a fever, insomnia, dulness, and incoherence; on the eleventh day, wild delirium; on the fourteenth day, convulsions and suppression of urine; sixteenth day, loss of speech (coma?); seventeenth day, death. The diagnosis was phrenitis. The author thought death was caused by the affection of the brain consequent on her accouchment. This case differs from a simple, acute non-septic mania, and bears evidence of septicæmia with typhoid delirium. The diagnosis of *phrenitis*, as applied by Hippocrates to this class of cases, appears to have been adopted by writers down to the present century. This is evidently due partly to the weight of medical authority, and partly to the pronounced cerebral character of many symptoms which were never verified by post-mortem research. The symptoms do not require, however, to be explained by inflammation either of the brain or its membranes. The earlier writers of modern times have formulated rules for diagnosis or prognosis based upon the recognition of this peculiar type. William Hunter,² in his manuscript lectures, says: "Mania is not an uncommon appearance in the course of the month, but of that species from which they generally recover. When out of their senses, attended with fever, like paraphrenitis, they will in all probability die; but when without fever it is not fatal, though it (fever) generally takes place before they get well." Gooch³ refers to those who say that puerperal mania may be confounded with phrenitis (meaning, evidently, an excited delirious state due to fever—*i. e.* sepsis?), but does not admit the rules of others for distinguishing the two conditions; and then gives his own rules for distinguishing them, which are not much better. The interesting fact is that he recognizes the importance of differentiating some febrile, delirious conditions from simple afebrile puerperal mania. Guislain⁴ draws a distinction between simple puerperal mania and puerperal meningitis. The latter is preceded by *abdominal pains*, has intense heat, and is very fatal; it is also characterized by sweats, and passes promptly into coma. This seems to be what others have called phrenitis, and is probably a septic condition with localized peritonitis. Rocher⁵ thinks a high temperature may appear if the woman is under the influence of the milk fever. This is a proper distinction, but the other symptoms of septic infection would of course not then be present. Clouston is one

¹ *Epidemics*, Bk. iii., Adams' translation.

² Quoted by Prichard, art. "Insanity," *Cycloped. of Med.*, p. 68.

³ *Op. cit.*

⁴ *Leçons orales*, vol. i. p. 356.

⁵ *Op. cit.*, p. 40.

of the few authors who give due prominence to sepsis as a cause of insanity in childbed. The temperature of all his cases was taken and recorded, with the following results: Of the 60 there were 34 cases under 99° ; 26 cases, or 43 per cent. of the whole, were over this, and 14 cases, or 23 per cent. of the whole, were over 100° . No other form of insanity, says the author, shows this alarming result. It is significant that all the deaths occurred in cases with a temperature over 100° , but all cases with very high temperature were not fatal. The causes of the high temperature were considered to be brain-excitement, inflammation of the womb, meningitis, and incidental causes, as malaria and mammary abscess. The relative importance of these causes is not stated, but sepsis seems to be the most definite of them all, and can account often for the others, as brain-excitement and possibly meningitis. Clark¹ gives details of 40 cases of puerperal insanity proper, of which number 18, or nearly 50 per cent., had septicaemia or simple inflammatory trouble about the uterus. Dr. Barton C. Hirst has reported 2 cases of primipara, illegitimately pregnant, who exhibited, as before insisted upon, a combination of causes, among which was sepsis: 1 died, the other recovered. In both these cases the moral element was seen in the character of the insanity, which was of a melancholic religious type, the patients dwelling constantly upon the sin they had committed, with prayers for their forgiveness. Dr. Alice Bennett of the Norristown Asylum has communicated to me the particulars of the following case, in which it seems probable that sepsis was the cause of a sudden and unlooked-for death: A married woman, aged thirty-five, primipara, whose sister had died insane after confinement, became violently insane ten days after the birth of her child. On admission to the hospital on the fifth day of her attack she was acutely maniacal, with a small, feeble pulse and indistinct heart-sounds. The perineum was torn and the cervix uteri was deeply lacerated and eroded. The temperature was not recorded. The urine was not albuminous, but presented a few hyaline casts. The patient took food, slept some, and appeared to improve for a few days, and the lochial discharge, which had been suppressed, was seen for the first time. It again disappeared on the eleventh day, and the patient had a chill, followed by a temperature of 103° and profuse perspiration. She collapsed and died the same day. In this case there were heredity, advanced age for a primipara, and so probably dystocia, and the local conditions favoring septic infection. Another case in the same hospital had had retained placenta, which had been discharged in pieces for some days, and had had inflammation and fever for three weeks. She was violent, delusional, and engaged frequently in prayer. She recovered,

¹ *Journ. Ment. Sci.*, July, 1887.

but had a good family history to fall back upon, otherwise she might not have got well in three months.

The delirium of septicæmia is not necessarily insanity, and the necessity of distinguishing a transient flighty state of the mind, due to any form of blood-poisoning, from a more enduring psychosis, is of great importance, both from a scientific and a personal standpoint. The greatest assistance to this diagnosis will probably be rendered by an attentive study of the antecedents and family history of the patient. If she is sprung from a neurotic family, one especially in which well-authenticated insanity has existed, and has been burdened with family cares, and is in an anæmic and prostrate condition, the probability is that her septic condition has been the one necessary cause to precipitate her into an alienation of mind; which will be more or less prolonged, and which may require the isolation and perfected system of a well-regulated hospital to terminate in the shortest time. If the patient's social and domestic circumstances are such that she can be properly treated at home with the most approved antiseptic methods, it may be worth while to test for a time her recuperative powers and the relative importance of the sepsis as a cause of her mental disorder by a continuance of a well-regulated treatment in her own house. A return to mental health, however, does not by any means invariably follow the disappearance of all symptoms of septic infection. This distinction is of great personal importance to the patient in her future relations in life, as well as to the physician who may assume the responsibility of certifying her to an asylum.

I have dwelt purposely at some length upon the causation of these forms of insanity, because they have, as before stated, more etiological than clinical significance. Some cases undoubtedly occur where the causation is obscure, and in which none of the elements referred to appear to have great importance.

SYMPTOMS.—The forms of insanity usually observed in the three periods under consideration are mania and melancholia. A third division has been made by some writers, following the older authors, into dementia. This last division is not a fortunate one, because the term "dementia," as used now at least, is confined almost exclusively to the terminal state of mental feebleness and decay into which all the forms of insanity tend to deteriorate. Thus the initial attacks both of mania and melancholia may terminate in unfavorable cases in dementia; and it is very probable that in the statistical tables of some observers the dementia of patients had been preceded by an initial attack of one of these two forms. There are, however, states of mental weakness, not necessarily chronic or incurable, to which the term dementia, especially *primary* dementia, has been given; and some of these cases of stuporous, fatuous, and confusional states have probably been included in the

tables under the general term dementia. Other forms of insanity have probably also been included in these three groups, which do not properly belong to them. It is possible that some genuine monomaniacs—by which term we now mean the constitutional and hereditary class of the insane with systematized and unalterable delusions—have come into these statistics; and a very few writers refer to having seen general paresis originate in, or precipitated by, an original attack of so-called puerperal insanity. It is impossible in this paper to attempt an exhaustive criticism of terms; but it is important to again call attention to the fact that there is nothing specially distinctive in the symptoms of the insanity which occurs in childbearing and nursing women; that the *form* of insanity which the case may assume varies according to other special relations, conditions, and individual peculiarities, and that these cases in almost all instances will be found to owe their origin to a combination of causes, of which pregnancy, parturition, and lactation contribute only a share. Again, mania and melancholia (which are the most common forms of alienation seen in these connections) may be present in the same patient, as is constantly seen. These terms include in themselves only superficial symptom-groups, which owe their origin to profound changes in the alimentation and nutrition of the brain. It is not uncommon to see a prodromal state of melancholia ushering in a very active mania, which in turn soon shows fragmentary or partially systematized delusions, with hallucinations of the senses; the attack passing into a state of feebleness or critical dementia before recovery. While these terms are thus subject to criticism, however, the fact remains that in most cases the prevailing type, as we may call it, is either melancholia or mania; and while the maniacal patient may have her temporary fit of depression, or the melancholic have her transient states of excitement, the two are sufficiently distinct to the mind of the alienist to continue always to hold their places in nosology. The insanity of pregnancy is most frequently melancholia; of the puerperium, mania and delirium; and of lactation, melancholia. Kraft-Ebing says that of puerperal insanity proper three cases to one are maniacal. Of Esquirol's 92 cases, 49 were maniacal, 35 melancholic, and 8 demented. Schmidt gives the following table. Of a total of 283 patients in the three stages, pregnancy, childbed and lactation, the proportions were—

Mania	123	=	43.5 per cent.
Melancholia	118	=	41.7 per cent.
Delusional insanity . .	20	=	7.0 per cent.
Dementia	14	=	4.9 per cent.
Dementia paralytica . .	6	=	2.1 per cent.
Circular insanity . . .	2	=	0.7 per cent.
Total, 283			

This table, as will be seen, does not present the relative frequency of these forms in the three stages, but the general statement already made will suffice.

In this connection, when about to study the symptoms of mental disorders in childbearing women, it may be well to view these disorders first in their relative frequency in pregnancy, parturition, and lactation. Schmidt's table is as follows:

Of 264 cases, in pregnancy there occurred	47	=	17.6 per cent.
in puerperium " "	130	=	49.3 per cent.
in lactation " "	88	=	33. per cent.

These results agree very closely with Ripping.

The combined statistics of Esquirol, Hanwell Asylum, Macdonald, Marcé, York Retreat, and Palmer give a total of 310 cases, divided as follows:

Pregnancy	27	=	8.7 per cent.
Puerperium	180	=	58. per cent.
Lactation	103	=	33. per cent.
	<u>310</u>		

Tuke gives 155 cases, as follows:

Pregnancy	28	=	18.00 per cent.
Puerperium	73	=	47.00 "
Lactation	54	=	34.00 "
			<u>99. per cent.</u>

These statistical results vary somewhat, but are nearly enough in harmony to give a correct idea. There are several fallacies to be guarded against, however, in reviewing them. The mental disorders of pregnant women may be slight, as alterations chiefly of disposition, with irritability and eccentricity, and yet these alterations stand as prodromal to a fully-developed attack of mania in the puerperium. Some observers may date the disorder from the pregnancy, others only from the fully-developed attack in childbed. So, too, of mental disease during lactation; it does not follow that all cases so labelled have been strictly limited to this period: *per contra*, many of them may have shown alterations in their mental states during the pregnancy; and it may so happen that the case which one observer includes in one period another may include in a prior state, depending upon the symptoms which may strike each of them as initial, or the period in which each happened to first observe the case.

This again illustrates how futile it is to attempt to establish a complete classified system of so-called puerperal and allied insanities, ascribing to each period or epoch distinctive symptoms, and with a definite

arrangement of diagnostics, prognostics, and treatment; and it emphasizes the fact that these forms of insanity and the periods of their occurrence must be grouped together and portrayed with reference to their general and special etiology.

Pregnancy, as before stated, is the cause or occasion of various mental changes and disorders. Many of these cannot be regarded as pathological, such as the changes in temperament, the caprices, and altered tastes and fancies, and even the alterations in the so-called affective faculties, as shown by slight perversion of the affections and moral sense. Some of these states and symptoms, however, border very closely upon distinct mental disease (which is, after all, but a relative term), and are of significance in this connection; while others have a nice medico-legal importance in reference to responsibility in case of thefts and other infractions of the civil law due to the longings and impulses of the pregnant woman, and especially in the case of subsequent homicidal and suicidal attempts. The most common disorder of mind observed during pregnancy is melancholia. The number of these cases observed and reported in asylums is certainly nowhere in proportion to the prevalence of such disorder in the sum-total of child-bearing women. In no condition or stage of life will a woman be less apt to be sent to an asylum by her friends than when pregnant, even though she be very badly insane; and as the insanity which shows itself then is often of a mild type, and even perhaps not always readily demarcated from the moral and other perversions referred to, the reason is still more evident why so few of these cases are reported. This melancholia of pregnancy in a mild form has been observed by me in a number of cases, most of the attacks being transient and recurrent, or, if sustained, of so slight a character as not to excite alarm. I have no doubt that moral causes are the most active of all to induce this condition, and the character of the depression confirms this view. Delusions are not common; in fact, the perceptive and reasoning powers of the patient are but little if at all involved. She is simply depressed and often apprehensive; and, in truth, has sometimes good reason to be so. This apprehension is most often felt in reference to her labor, but not always, for sometimes it is a vague sense of impending danger or trouble which is not formed into ideas or expressed in words. She changes in her affections, or, more properly, she partially loses them. Her husband, children, and household affairs have no longer the same interest for her, and instances are recorded where aversion to the husband takes the place of love. This latter change is probably obscurely related to the sexual instincts and habits, and may be due in part to a sexual relation which is enforced and repugnant. The patient is sometimes only listless and apathetic, at others quite perceptibly and abnormally depressed. In the more severe forms of melancholia, from

whatever cause, the countenance is apt to show an expression of great sadness and apathy; the eyes are dull, downcast, or averted; sometimes the attitude also is expressive of dejection, and speech is elicited with difficulty and only on persuasion. I have not seen such grave cases of melancholia occurring in pregnancy, but such are reported. In some cases acute attacks of insanity occur, either of the form called agitated melancholia—in which the patient's depression can no longer be endured, as it were, in silence and dumb show—or of active mania, with delirium and incoherence. This latter form must be very rare, and probably occurs in cases which have a well-marked heredity or in which there may have been a prior attack of insanity. Insane women who become pregnant may, of course—and usually will—continue to show their characteristic symptoms during pregnancy, and without much reference to this state. We have at present in the Philadelphia Hospital such a patient, whom it would be a great mistake to call an example of insanity of pregnancy in any sense. She is simply an hereditary lunatic who very unfortunately conceived a child. The tendency to suicide ought always be suspected in melancholia, whether of pregnancy or not. This impulse has been so often noted in all the insanities connected with childbearing that it may be regarded as very characteristic. I recently saw in the German Hospital, under the care of Dr. John B. Deaver, a woman four months pregnant who attempted suicide by throwing herself from a window, and who broke her collar-bone and suffered a meningeal hemorrhage over the cortical speech-centres, but who did not abort, and who will probably remain suicidal to the end. Primiparæ are supposed to suffer more with melancholia than multiparæ; and the figures given by some observers prove this: it is also in accord with the view of the moral cause in these cases.

The most distinct of all the forms of insanity now under consideration is undoubtedly the mania which comes on within a few weeks after labor. This is the true puerperal mania, which has attracted the most attention, as it is the most frequent and alarming of all these mental disorders. The puerperal patient who becomes the victim of this disease may have exhibited for some time suspicious prodromal symptoms, or the attack may appear quite suddenly. In some cases, perhaps the majority, the period of pregnancy has been marked by some of the peculiarities already referred to, or the patient may even have been noticeably melancholy and changed. These psychoses of pregnancy do not all invariably disappear with the labor, but may be seen occasionally to have constituted a premonitory stage for a more serious alienation. It is not an uncommon observation, in fact, that a melancholic status is the immediate forerunner of an attack of acute mania. In a literal sense, "melancholy is the nurse of frenzy," and appears to characterize that initial period during which the patient has still enough self-

consciousness preserved to be aware of impending suffering and illness—something amiss or awry in the mental fabric—before the personality is lost in the agitation and incoherence of the maniacal processes. This precedent stage of depression may be short and may escape the observation of nurse and friends, or it may be noted that the patient becomes fretful and moody, irritable, and apt to find fault easily and unreasonably. She may be absent-minded, changed in her disposition, and begin to exhibit resentment toward her husband and friends or aversion to her newborn babe. She becomes perhaps the creature of uncontrollable impulses: this impulsive nature of her disorder, indeed, is very common and characteristic. Some sudden act of this kind is occasionally the first symptom which abruptly intrudes itself upon the attention of unobservant attendants, and forces upon them the alarming conviction that their patient has become a maniac. One patient of whom I have knowledge threw a heavy glass inkstand at her husband as he entered her bedroom, and with this argument convinced him that she was insane. This is the mental state which leads to sudden suicide or homicide, and which has caused some of the most distressing accidents in the history of insanity. The lives of mothers and infants have been sacrificed because this tendency has been unappreciated or ignored. The patient under this impulsive disposition may wander away, making a very sudden disappearance, and may be found, perhaps in a public place at a distance in her night-clothes, it may be with suicidal intent or wandering aimlessly. In the case above referred to the lady, after her disorder was recognized, eluded the vigilance of her keepers and ran a long distance down a country road clad only in a night-dress. Because of the physical conditions attending the puerperium this exposure might be attended with especial danger. An early symptom is sometimes an unnatural gaiety and loquacity. The patient laughs immoderately and without cause, and may change quickly to tears in a genuine hysterical transport. She talks incessantly—not exactly incoherently at first, but her ideas succeed each other with unusual rapidity and uncommon powers of expression. A moral shock has been known to precipitate the disease, as the loss of the child, unkind and cruel treatment, or the receipt of bad news, instances of which are recorded. The prodromal period is usually short; and this has been considered by some observers, especially Kraft-Ebing, as quite characteristic of puerperal as distinct from non-puerperal mania. When the disease is once declared it usually rapidly reaches its acme; thus, the patient in whom nothing wrong was suspected may in a few hours be in a most violent maniacal paroxysm.

The symptoms of mania, as seen in all conditions, are especially exaltation and incoherence. The patient is noisy, restless, possessed of a factitious strength, and exhibits the facial expression of fleeting and alternating emotions. The powers of perception are very much

impaired, the memory more or less effaced, and the intellectual processes entirely in disorder. She laughs, talks, combats, and shows a physical activity and endurance which are quite beyond her ordinary powers, and which still further tend to exhaust her. In some the prevailing tone is good-humor, in others there is rage, or these alternate; or perhaps the emotional tinge is not very apparent. The language of the patient is especially indicative of the disorganized state of the mind. Sentences are incomplete and follow each other in no orderly or logical sequence. If attentively observed, these phrases may display fragmentary delusive ideas, but nothing systematized or fixed. The patient's self-consciousness at the worst is quite overwhelmed, and she may recognize few if any of her surroundings and attendants. Confusion of the identity of self and of friends is thus quite common in mania, and has been considered by Tuke, but without apparent reason, to be pathognomonic of the puerperal form. It is certainly common enough in non-puerperal forms. Hallucinations or delusions of the senses are common. These are the false sensorial images of the insane. The patients see things and hear sounds which have no objective reality, but are simply the evidences of disordered subjective processes. Sight and hearing are the senses most affected, although hallucinations of taste, smell, and the tactile sense are not unobserved. These symptoms vary of course in their combinations and intensity in different patients.

In the most delirious forms all sense of personal modesty and decency may be lost, the unfortunate patient exposing her person and passing her dejecta into her bed. Many puerperal patients use very obscene and opprobrious language, and the wonder of horrified relatives is great where and how modest, virtuous, and refined women could ever have learned words and expressions the very sound and utterance of which seem to carry pollution. This tendency has been almost universally regarded as special to and distinctive of puerperal mania; and it has no doubt been so frequently observed that it may always be apprehended. But there does not seem to be sufficient reason to confine this symptom so exclusively. The maniac from whatever cause is not apt to be very choicé in his or her language, and, on the other hand, cases of mania following the puerperium do not always exhibit this predilection. Sexual excitement and erotic manners and conduct have also been considered characteristic by some writers, who appear to want to make of this distressing malady something still more sensational and bizarre. That such symptoms occur I am not prepared to deny—on the contrary, it seems probable that obscure forms of irritation of the genitalia may sometimes exist and produce a special train of symptoms—but that masturbation is a common accompaniment of puerperal mania, as some have said, appears to me to be doubtful. The associations of the puerperium may especially

direct the patient's disjointed thoughts to sexual and allied subjects, and give to her language a spurious erotic tinge; but self-abuse would not be likely to be excited in such a patient except by some local irritation.

Insomnia is an almost constant symptom. The bodily functions are impaired, the tongue coated and foul, the appetite abolished, and the bowels probably confined. A rise in temperature may occur, and always will in those cases which suffer from septic infection; in fact, a continued rise in temperature ought to put the practitioner in mind of this possible infection, because the probability is great that high temperature in the majority of these cases is caused by sepsis. Clouston's reported cases, already referred to, are very instructive in this connection. In these septic cases other distinct symptoms will be apt to be present. Abdominal pain and swelling, the evidences of a more or less localized peritonitis or of a metritis, may be present. The lochia, in these cases especially, are suppressed or bad-smelling, the tongue brown and dry, and the delirium may be rather of the muttering and typhoid type, varied perhaps with paroxysms of great violence. Two such cases are reported in a preceding part of this paper.

The following typical case of acute puerperal mania was recently examined, and her certificate signed, by me, by invitation of Dr. Chapin of the Pennsylvania Hospital for the Insane: Mrs. ———, aged twenty-two, had had an easy and natural labor with her second child, and appeared well in every respect until two weeks later. At this time she heard of the death of her sister's baby, born about the same time as her own. This event preyed upon her mind. She became depressed, restless, and wakeful at night; she lost her appetite and began to get thin and pale. Two weeks later she began to have paroxysms of excitement with delusions about her nurse and husband, and she imagined that her baby was dead or dying. This condition continued for another two or three weeks, when she suddenly became very much worse. She refused food and became noisy and troublesome in every way. She required to be watched to keep her from escaping from the house, and often had to be held in bed to prevent her injuring herself. For a week before admission to the hospital she had slept scarcely any and had taken little if any nourishment. Upon examination she was found emaciated and anæmic with a brown, dry tongue. She had a fixed, staring gaze, with dilated pupils, and would not respond to questions. She was very restless, throwing off the bed-clothing if the nurse turned away a moment, exposing her person and attempting to rise. There was no abdominal soreness, no fever, nor any milk in her breasts. Later she was talkative and incoherent. There was no albumen in her urine. We examined her blood and

found the number of corpuscles reduced 20 per cent. No family history of insanity was obtained in this case.

The following case is so illustrative of the causation, symptoms, and lamentable results of this disease that it is presented in full; it occurred in the practice of Dr. E. P. Townsend of Camden, who has narrated it to me: A primipara, aged twenty-one years, was delivered with forceps after a tedious labor, during the early stages of which she had been much excited and very apprehensive, and during the last three hours of which she suffered with a series of eleven severe convulsions. She had had œdematous ankles and feet. She was bled and treated with morphia. The patient continued entirely out of her mind until the ninth day, when she became apparently rational for the first time, but had no memory of the events of her illness. The nurse and mother, contrary to the physician's advice, insisted upon bringing the child into the room, that the patient might see it, at the same time entering into an elaborate explanation of the events of the preceding ten days. They then placed the child in bed alongside of its mother, and in a few minutes both attendants left the room. In an instant the patient seized the infant by the legs and dashed its brains out against the wall. By the time her attendants could return to the room she was again a raving maniac. She recovered after three months. Her physician afterward delivered her of two children without a return of any mental disorder.

The physical condition of women who suffer with insanity during lactation is usually one of exhaustion and anæmia, and the form of mental disease most common among them is melancholia. Of this group of cases perhaps less that is distinctive is observed than in either the pregnant or puerperal cases. The patients are usually from the poorer classes of society, and are mostly multiparæ who have already borne more children than it was good for either themselves or society that they should bear. They are women who have been overworked, and who seem to produce children in an inverse ratio to their pecuniary incomes. Statistics point unerringly to all these facts, and still further indicate the etiology of these mental disorders. More than one-half of Tuke's cases of so-called lactational insanity occurred after nine months of nursing, proving the effect of long-continued lactation. Clouston observed only one-half as many lactational cases among his richer patients as among the poor, while the two classes furnished about equal numbers of puerperal cases.

The depression of mind in these cases corresponds to that which has already been depicted in general terms. It seems, however, that these patients are more apt to have delusional ideas. These delusions are of a depressing kind—the delusions of persecution. They consist of erroneous ideas about relatives, neighbors, and friends, as that these are

hostile and say false and slanderous things about the patient. These delusions have some system and consistency, but are not very fixed. They may, however, lead to deplorable actions on the part of the patient, the most common being suicide. Possibly in many cases the symptoms are little more than listlessness, apathy, dejection, and a general sense of personal unworthiness, along with the physical state of anæmia and loss of flesh. The patient under these circumstances will of course neglect her household duties, or rather capitulate to them. In the more advanced cases a decided element of mental weakness is apparent, and is indicated by a loss of power of attention, a disinclination or inability to engage in conversation, and an expressionless face. There is complete loss of spontaneity. Hallucinations may be present in the worst forms of this disease.

All cases of insanity due to prolonged lactation are not, however, melancholia, although I am inclined to think that some of the maniacal cases reported are more correctly agitated melancholia. Still, true cases of mania and delirium, or confusion with mental weakness, no doubt occur during the nursing period. In fact, maniacal excitement may indicate brain-wear and exhaustion just as truly as states of depression indicate them; which still further emphasizes our ignorance of the intimate pathology of these states and of their immediate causation. In cases of acute mania which tend to recovery a period of transient critical weakness or dementia often occurs toward the close of the attack, and is consequently a favorable omen. The patient rallies from this weakness, sometimes quite suddenly and unexpectedly, and is as one emerging from a dream. This has been noted by some, especially in puerperal and allied forms of mania.

Some observers say that they have seen in the puerperal state the beginning of general paralysis of the insane. Kraepelin says that he has twice seen this. It may be a question whether such cases are instances of causes or merely of coincidences. General paresis is comparatively rare in the female sex, and is not as well marked as in the male. Mickle¹ thinks that a suppression of lactation may act as a cause of this disease. He presents a table of 910 cases of dementia paralytica in women, of which 7.5 per cent. are assigned to pregnancy, parturition, and lactation as exciting causes. Of these parturition has 5 per cent. of the 910 cases. I have observed the case of a woman in the Philadelphia Hospital who was admitted when in the sixth month of pregnancy. The attack of insanity began with some grandiose ideas and extravagant conduct. She took \$700, which she had saved with difficulty, and squandered it in a few days. She was of a very contented and happy frame of mind, but I have never seen in her the characteristic expansive delusions and boastful demeanor, with alterations of

¹ *Gen. Par. of the Insane*, 2d ed., Lond., 1886.

speech, which are so common in male paretics ; yet she has some optic atrophy and unequal pupils, and her patellar reflexes are rather lively. Further inquiry revealed the fact that her mental symptoms began some time before her pregnancy ; and this is probably the truth with some other cases which are reported as due to the puerperal state.

Transitory mania or delirium, occurring at the moment of the birth of the child, has been observed not unfrequently, and is described by a number of authors. Marcé has a separate chapter on this subject, and enlarges upon the mental traits, excitement, aversion to husband and child, frantic conduct, and uncontrollable terror and despair, which some women exhibit at the supreme moment of their agony. In some cases, comparatively rare, this excitement has been known to pass into veritable mania. In these cases, as in so many types of alienation, it becomes largely a question of the degree of excitement, of the extent of the departure from the norm of mental equilibrium and control, which will constitute a true psychosis. Obstetricians, especially those who do not make a general practice of resorting to anaesthesia, must frequently see these states of excitement in varying degrees in women who bear pain badly and who may be subjected to prolonged suffering and instrumental interference. I believe it is a mistake to attempt to extend too widely the practical definition and recognized limits of insanity, especially when questions of medical jurisprudence are involved ; and I think that a great majority of these cases of very transitory excitement during the second stage of labor cannot consistently be called examples of insanity ; and yet the fact remains that an occasional case does happen, and such have been recorded by the most eminent observers, in which the delirium is so acute, the loss of self-consciousness and memory so marked, and the extravagance and desperation of deeds committed are so extraordinary, that the patient must be regarded as temporarily and irresponsibly insane. I have certainly seen cases in obstetric practice, especially in primiparae, which have approached this degree of impairment, in which the patient, under the influence of intolerable pain, passes quite beyond moral control for the time, uses language and commits minor acts of resentment and wrath toward husband or physician which are quite out of accord with her usual disposition and deportment, changes quite perceptibly in her mental tone, and has very little recollection afterward, in her exhaustion and relaxation, of her unusual behavior. These extravagances of the parturient woman, which sometimes excite a smile in her experienced attendants, may have a deep and painful significance. Under the influence of her travail the patient calls in vain for assistance, attempts to injure herself, tears at her genitals, or expresses aversion to her unborn babe. Cazeau says¹ that this delirium is almost always preceded and

¹ *Midwifery*, p. 300.

accompanied by great loquacity and the pains are hardly felt. He relates the case of a young lady who after rather a lengthy labor attended with extreme suffering suddenly ceased complaining, assumed a smiling expression, and after a few incoherent phrases sang in full voice the grand air of *Lucia di Lammermoor*. Oslander¹ delivered a woman of twins who was with difficulty restrained by two strong men from throwing herself from a window. He had also seen another woman who demanded that her abdomen be opened, and who had procured a knife for that purpose. He cites the case of a negress, seized by delirium in the midst of a prolonged and painful labor, who opened her abdomen, extracted the child, and recovered. Weill quotes Henke, who saw an access of acute mania come on with the expulsion of the after-birth, although the preceding labor had been happy. Klug (quoted by Marcé) reports the case of a peasant-woman who in an access of mania accompanying a delivery by the forceps became violent to the point of endeavoring to strangle her child. Helm has reported an access of mania relieved by the rupture of the bag of waters. Kraepelin had under his care a puerpera who threw herself out of a window and through the glass roof of a green-house below.

It thus appears that the subject is fraught with great medico-legal interest, which will be referred to later. It has also some special psychological interest, which is curious if not of much practical importance. Marcé suggests the query, Can a woman in the last stages of her labor be exposed to an access of mania during which she uses violence to her infant, for which she is not responsible, resembling in this those females of certain animals who are sometimes seized during parturition with a fury in which they throw themselves upon their young and bite them to the point of killing them? This suggests the fact that in mental diseases there may be, as some have said, a reversion to the more primitive and instinctive acts which ally the human mind to the instinct of the lower animals. We see in some of these cases a fury which rends the innocent cause of suffering, a perversion at least of the maternal instinct which succumbs to the more dominant instinct of self-preservation, not unlike the Jewish woman of whom Josephus tells us that she devoured her own child during the siege of Jerusalem.

DIAGNOSIS.—Little more can be added to this view of the subject than has already been presented under the etiology and symptoms of these mental disorders. The physical condition of the patient and the physiological processes through which she is passing or has just passed are so unmistakable, and the symptoms of mental disorder as a sequence of this state or of these processes, in part at least, are so apparent, that even the most general rules do not appear necessary to assist the diagnosis. It may be just as well, however, to indicate a

¹ Quoted from Jörg.

few possibilities of mistake which have apparently been made occasionally by observers. The presence of an acute delirious state of mind may be due almost wholly to septic infection, and be a part of the typhoid condition into which a patient may pass. I have seen several of these cases, one of which has been narrated. That patient recovered from her febrile state, but passed into a prolonged insanity; and I think it probable that such may be the history of many of these cases. Still, cases may occur with a tendency and power to recover from a temporary delirium due to septicæmia and exhaustion; and such cases ought of course to be carefully distinguished if possible, and not be hastily judged insane and sent to asylums. If other causes of insanity do not exist, such as heredity and anæmia, and the patient shows a tendency to improve under antiseptic treatment, it is obviously better not to act hastily in certifying the patient to be insane. Any slight delirium or flightiness due to the milk fever alone must be a very rare condition: I do not recall having seen a well-marked instance. It would certainly not be readily miscalled puerperal mania by an intelligent observer.

The occurrence of delirium tremens as an accompaniment of the puerperium presents a subject of some interest and importance in the diagnosis. Copland,¹ I believe, was one of the first to call attention to this subject. He says he had been called to cases which were, in their remote causes and essential features, instances of delirium tremens occurring in the puerperal state. He thinks that the usual tremor of delirium tremens may hardly be observed in some of these cases; hence additional liability to mistake. He attaches much importance to this tremor when present, and says it is to be imputed to alcoholic excess. Fordyce Barker² relates the case of a physician's wife who had pelvic peritonitis with rapid pulse and high fever following childbirth, and who acted at the start like a patient with delirium tremens; so much so that her husband had about arrived at this annoying diagnosis. The alcoholic element, however, could be excluded from the case. In women addicted to drink pregnancy may be an additional incentive to it, and the indulgence will of course be likely to be secret; the puerperium brings an enforced abstinence which may then precipitate an attack of real *mania a potu*. The history of these cases would of course be the most valuable aid to diagnosis. I do not know of any particular symptom, not excepting the characteristic tremor, which would be decisive. Time and careful surveillance would probably do much to clear up the nature of the case.

Insane women who become pregnant might be miscalled examples of puerperal insanity or the insanity of pregnancy, but the history of the case in these instances would probably be attainable, and the marks of

¹ *Dict. of Medicine*.

² *Op. cit.*

chronicity in many of them would not escape an experienced eye. Mania as a result of childbirth in cases of illegitimacy, where the labor has been concealed and the infant has been killed or abandoned, has been referred to by some French writers as having occurred, and as being a possibility. In such a doubtful or suspected case the surviving signs of pregnancy, parturition, and lactation would avail, such as the *lineæ albicantes* in primiparæ, the state of the uterus, and the presence of any lochial discharge and distended breasts. No special mental symptoms could be relied upon to establish such a diagnosis.

PROGNOSIS.—An old observer of these diseases, who is quoted by Gooch, attempted to establish this aphorism: “The question is not, *Will* the patient recover? but, *When* will she recover?” and yet the patient about whose recovery he spoke thus confidently died within a week. This fairly illustrates the too great confidence which has been sometimes felt by those who have been called upon to treat or examine these mental disorders, and especially the mania of the puerperium. Statistics show that a certain proportion of these cases die or become chronic; and they also seem to show that, of the causes already mentioned, some have a definite preponderance in producing death and others in destroying the patient’s mind. Gooch gives expression to an aphorism more exact than the one he quotes. Mania, he says, is more dangerous to life, melancholia to reason. He cautions practitioners to give a guarded prognosis, and reports two fatal cases—one in a few days, in which an autopsy revealed nothing abnormal in the brain or elsewhere. Esquirol gives a favorable prognosis, and says that “more than half” are cured; which might be a very bad result. Of his 92 cases, 55 were cured, but, as Gooch says, these statistics of Esquirol’s are misleading, as he had very bad cases only in the Salpêtrière. Webster reports 81 cures from among his 131 cases, or 61.83 per cent., and says that the average for twenty years of all females at Bethlem was 53.67 per cent.; but Bethlem Hospital is open to the same criticism as the Salpêtrière. Griesinger thinks that the prognosis is favorable, but still the curability has been over-estimated. Schmidt gives the following tables of the duration and results of these various forms of insanity:

DURATION.

Insanity of pregnancy . .	{	mania	8.6 months.
		melancholia . .	9 “
Puerperal insanity . .	{	mania	10.3 “
		melancholia . .	14 “
Insanity of lactation . .	{	mania	10.7 “
		melancholia . .	12 “

RESULTS.

2963 insane females . .	{	enred	34.6 per cent.
		improved . . .	12.8 “
		unimproved . .	40.6 “
		died	11.9 “

283 cases of puerperal and allied insanities .	cured	36.2 per cent.
	improved	19.3 “
	unimproved	37. “
	died	7.5 “

RESULTS IN THE THREE GROUPS OF INSANITY.

	Cured.	Improved.	Unimproved.	Died.
Pregnancy	35 per cent.	27.4 per cent.	35.3 per cent.	2. per cent.
Puerperium	53 “	17.8 “	22.6 “	10. “
Lactation	25 “	16.4 “	45.6 “	6.3 “

I do not know what value is to be ascribed to these results. The terms used are liable to different interpretations by different observers, and the social and physical conditions of these patients are not clearly indicated. I consider these tables as probably among the least valuable and reliable of all statistics on this general subject. So too of Luebben. He gives the following :

Of 727 cases from various observers, 463 were cured, or 63.73 per cent.
Of 642 cases from various observers, 66 died, or 10.28 per cent.

Tuke says that none of the three forms or groups are very fatal unless complicated with inflammatory processes ; and this is a very suggestive and important observation, because the probability is great that septic infection is responsible for many deaths among these cases. Thus, among Clouston's cases all deaths occurred in patients with a temperature over 100°, although all patients with high temperature did not die. He emphasizes the great curability of the disease. Of his 60 cases, 45 recovered = 75 per cent. Most of his recoveries took place quickly : in three months over one half the cases were well.

The influence of inflammatory processes and blood-poisoning in causing death is an important one, and as part of the general subject of septiciæmia in the puerperal group of insanities is deserving of especial attention and still further research. McLeod thinks that there is usually in fatal cases some complication, as uterine inflammation and septiciæmia. A certain proportion of these cases die also of diseases of the lungs, heart, and kidneys.

PATHOLOGY AND MORBID ANATOMY.—It is not necessary to recapitulate the speculative and fanciful ideas which have been held about the pathology of these groups of mental disorders ; some of which have been already stated. Some of the more modern ideas on the same subject appear to me to be equally unfounded, although perhaps not so unreasonable. The custom has been, up to the present time, to deal in very vague and generalized terms, which when analyzed and rigidly examined convey little, if any, accurate information. No one stops to combat the ideas of Hippocrates and Galen, that the vapors ascend from the mammae to the brain ; or those of Puzos, that lacteal deposits are made in that organ and produce madness ; or the

opinions of a host of antique pathologists, that the lochial discharge is suppressed and excites the brain or stupefies it. But many will read in Morel that "the uterus becomes the seat of an irritation too intense not to react upon all the nervous system," or in Reid and others about the "irritability and excitement of the nervous system," or peruse in various authors statements and descriptions of "irritations" and "reactions" and "alterations," and will not stop to think that these terms, often meaningless in themselves, are at best only the expression of certain facts and not the adequate explanation of disease-processes.

The pathology of simple acute mania and melancholia has not been adequately stated by any one, so far as I know. In fact, I do not understand how the morbid processes of an organ can be described when its normal processes are so complete a mystery as in the case of the brain. The mechanism of thought, the obscure physiological process by which a blood-nourished viscus elaborates consciousness and reason, is absolutely unknown and perhaps unknowable; and the problem is not simplified by discussing its blood-supply, its cell-metamorphosis, its nutrition, its dynamization, its morphology, or its histology. Alterations in these may and do throw some light upon the causation, conditions, and morbid anatomy of mental diseases, but certainly do not explain the intimate pathology of them. The character of the symptoms in cases of mania and melancholia, and the physical antecedents and conditions of many of these patients, indicate that this thought-viscus is profoundly disturbed in its nutrition; but more than this it does not seem possible to say. In the occasional autopsies which have been made in these early and acute forms, the morbid-anatomical state found, or reported to be found, is usually only such as indicates an altered vascular system, such as hyperæmia or paleness of the brain-tissue: in some of these cases, however, observers have been frank enough to say that they have found nothing. Some observers record the evidences of inflammatory processes in the brain or its membranes, but their clinical symptoms do not always accord strictly with these. Reid reports a case of "phrenitis" in which the symptoms were headache, suffusion of the eyes, etc.; only such symptoms as may well attend acute febrile delirium, but without local paralyses, increased tendon reflexes, stiffness of muscles, etc. Inflammation of membranes (and cortex) may exist in some cases, and especially in those which are of septic origin. The evidences of this would be thickened and opaque membranes, a vascular brain-tissue, distended ventricles, and enlarged—perhaps tortuous—blood-vessels. In old or chronic cases of insanity the convolutions may be shrunken, and consequent gaping of the sulci exist, but these things require a nice eye to distinguish. Dr. A. Campbell Clark¹ has made a microscopic study of the brain from a case dying in a typhoid

¹ *Journ. Ment. Sci.*, July, 1887.

delirious state. He reports extreme vascularity, with tortuous vessels, of pia mater and gray matter, dilatation of perivascular spaces, with perivascular sheaths loaded with small cells, minute extravasations in brain-substance, and the nuclei of the neuroglia exceedingly numerous.

Altered states of the blood have a significance in the pathology and morbid anatomy of these diseases. The determination of anæmia is now much assisted by microscopic examination and the counting of blood-corpuscles. Careful examination of the blood by all available methods ought to be made in all acute cases of insanity. Dr. Barton C. Hirst has reported the case of a primipara impregnated two months before marriage who developed hemichorea in the sixth month of pregnancy, and then sank into a state of great mental weakness or fatuity, with irregular pulse, pyelitis, and anæmia. The examination of her blood showed hæmoglobin 40 per cent., corpuscles $3\frac{1}{2}$ millions. The corpuscles, after induced premature labor, sank to $2\frac{4}{5}$ millions.

I have started inquiries into the condition of the blood in a number of cases of insanity following labor or occurring during lactation.¹ In the case of a colored woman suffering with melancholia agitata, who had been nursing for six months, and who still had milk in her breasts when admitted into the Philadelphia Hospital, the count gave three and three-quarter millions of corpuscles, with 85 per cent. hæmoglobin: at the end of a month's treatment and feeding, during which her mental and physical condition did not improve, the second count gave the same result. In the case of a young multipara in acute mania, who was emaciated, but whose skin and mucous membranes preserved a good color, the corpuscles numbered about four millions. In a multipara who had borne eight children in twelve years of married life, and who was very thin and in a restless, muttering delirium, the blood-count gave three and three-quarter millions of corpuscles. This was in spite of the fact that this patient had been taking immense quantities of nourishment in the Pennsylvania Hospital for the Insane, where I saw her. In her case, however, there was the suspicion of some tubercular deposit in the lungs.

The complex problems presented by uræmic and septic infections of the blood have not been as yet sufficiently solved, in their relation to the pathology of mental disorders, to make a discussion of them practicable or profitable. That septic infection has an important etiological relation has been already stated and illustrated, but the mode of its operation upon brain-tissue is not understood.

TREATMENT.—The first question of importance which will present itself to physician and friends, especially in acute puerperal mania, is the advisability of removing the patient to an asylum. There are

¹ Drs. W. R. Wilson and W. T. Sharpless of the Philadelphia Hospital have rendered assistance in this work.

arguments pro and con., and they will weigh differently under different circumstances. The objections to such removal are few and time-honored, but no practical physician but will be obliged to acknowledge their existence and the persistency with which they are enforced. They consist entirely of the fear of the stigma or reputation of having been insane which clings to the asylum case. It is useless to inveigh against the injustice of this as long as the fact remains; and the fact probably will remain as long as the human imagination and understanding continue as they are now constituted. Physicians themselves are not more exempt from this feeling when their own families are invaded than the rest of the community, and all must acknowledge that there are validity and force in the objection. On the other hand, puerperal, like alcoholic, cases, do not suffer as much in this respect as other cases of insanity, as there appears to be a more general common-sense opinion abroad that in mental disorders from these causes the patients suffer only a temporary and curable delirium, due to a cause which is not persistent and which is often under control. This general opinion is no doubt due to the favorable results of treatment in many of these puerperal cases, and is an additional indication of the favorable prognosis which may be usually given in them. Putting aside this popular prejudice, I do not hesitate to say that in the great majority of cases it would be for the patient's good to send her at once to a well-regulated asylum. This is obvious in cases where her means are limited and prevent her from having the seclusion and trained and exclusive treatment at home which her condition so imperatively demands. But even in the case of patients who are affluent the necessity is often not less apparent. The special circumstances attending the maniacal excitement, such as the need of constant watching, the requirements of careful feeding and medication, the control of the extreme agitation and noisy delirium, the prevention of impulsive acts of violence, as suicide or homicide and sudden disappearance, the resistance to the tendency to rapid exhaustion and death or to chronic insanity,—make the case often one of such extreme responsibility and care that it becomes absolutely necessary to consign the patient to the care of those who have special accommodations, attendants, and training for treating these cases. A further and most important advantage of asylum treatment is the isolation, the perfect rest and freedom from the irritation of the domestic environment, the moral effect of a system which works with precision and regularity, without undue coercion and friction, which these institutions afford. Even such an experienced alienist and superintendent as Clouston, however, says that many of these cases can be treated at home, and that it is well so to treat them when possible.

I desire to present and emphasize a few special items in the treat-

ment of these disorders, rather than to attempt a general and elaborate scheme of therapeutics, such as is usually the result of a compilation of the various and conflicting opinions of a host of writers. There are some well-recognized principles of hygiene, dietetics, and therapeutics which are more or less applicable to all forms of disease, and these I will not attempt to describe again. But there are a few very important and special requirements in the treatment of the insanities of pregnancy, parturition, and lactation about which I have individual opinions based upon some observation. These may be briefly arranged under the heads of diet and medicines.

The indication given by a large majority of these cases in an impoverished blood-state is to feed. I have no doubt that good feeding, with emancipation from household drudgery and exemption from further conceptions, abortions, and prolonged lactations, would in many of these cases be all the treatment required. I think this is the reason these cases admit usually of such a favorable prognosis, because the anæmic basis of their disorders can be corrected under the attentive and skillful administration of food in good asylums. These are the cases of which Dr. William Hunter speaks when he says, "In general, this species of mania cures itself. I imagine that in all my business I have seen twenty or thirty of these cases, and all of them did well." The kind of food required, it goes without saying, is the simplest, most easily digested, and most nourishing. Milk and eggs, strong broths, succulent vegetables, and tender meats of course make up this *ménù*. But it is not so much the selection of these articles, which the judgment of the simplest housekeeper could determine, as it is the proper and persistent administration of them. Certain adjuvants to feeding are necessary in many cases. In the more delirious forms the food ought to be given every two or three hours, including the night, and in all forms the daily supply ought to amount to a sum-total which the physiological processes require. A quart to three pints of milk (perhaps artificially digested), with from four to six soft eggs, a day, is the minimum which some would allow: at any rate, it would be safer to err on the side of too much than too little food, as the former error could be recognized and corrected sooner than the latter.

The state of the bowels ought to be carefully watched in the insane, especially in those who require extra feeding. Constipation ought to be corrected, for with it the patient will not eat and digest as she ought. Fresh air not only allows but compels any person to take and assimilate more food than he or she otherwise would do; and this hint ought to be sufficient for those who have the charge of these patients. One of the advantages of hospital treatment is the fact that this demand can usually be met with a care and privacy which are impossible when the patient is kept at home. In very excited and perverted cases forcible

feeding by the stomach-tube becomes a painful necessity, but ought never to be attempted without the personal supervision of the physician.¹

The iron preparations, say Laveran and Teissier,² constitute the rational medication for anæmia, but in order to be efficacious need a number of adjuvants. If the anæmic patient is in poor hygienic conditions, if her food is insufficient, if the air which she respire is vitiated, if the light of day and the rays of the sun do not reach her, the ferruginous tonics in all their forms will not cure her anæmia. In a word, iron does not make blood in all its parts. The best preparations of iron, in my experience, for all forms of anæmia, are Bland's pills (a combination of sulphate of iron and carbonate of potash), and, when the bowels and uterine functions are sluggish, the combination of sulphate of iron and extract of aloes. In inflammatory states of the uterus the latter would be contraindicated. In maniacal and unmanageable cases, in which pills cannot be administered, the best preparation of iron is the tincture of the chloride, or, if this disagrees with the stomach, the powdered carbonate of iron or the ferrum redactum. But iron, it seems, is not always the specific for anæmia. Arsenic of late has many advocates, especially in the more grave forms of pernicious anæmia which sometimes accompany or follow pregnancy. Osler³ has recently reported a case of profound anæmia following a fourth pregnancy in which the patient could not sit up without fainting, and whose blood gave only 1,170,000 red blood-corpuscles to the cubic mm.; which corpuscles were extremely irregular in size and shape—a characteristic of the corpuscles of anæmia. This patient had received 20 drops of the tinct. fer. chlor. three times a day for nearly two months, but had failed steadily during its administration. Under the use of Fowler's solution of arsenic improvement began at once, and continued until the patient grew large and robust. The administration of the solution of the arsenite of potash was begun in this case in five-minim doses, t. i. d. and increased one drop a day until ten minims were reached. Doses as high as twenty or twenty-five minims t. i. d. are advocated, the gauge being the physiological effects. Osler believes that arsenic is almost a specific in all grave forms of anæmia, and quotes Padley, who collected statistics which show that of 48 cases treated without arsenic, 42 died; of 22 cases treated with arsenic, 16 recovered, 4 died, and 2 improved. I think a combination of these two drugs is serviceable in many forms of anæmia and asthenia.

The use of hypnotic and sedative medicines in insanity calls for the

¹ For an interesting discussion of this subject by Drs. Jones, Chapin, Brush, Hall, Mills, Phillips, and Weir Mitchell, see *Proceedings of Philada. Neurolog. Soc.*, March meeting, 1888.

² *Op. cit.*, p. 346, vol. i.

³ *Bost. Med. and Surg. Journ.*

exercise of caution and judgment. When the anæmic and asthenic state of the puerperal and lactational patient is considered, it must be evident that a sustaining, and not a depressing, treatment is the proper one. Such a sustaining treatment has not only a remote, but sometimes an immediate, effect in calming excitement, relieving mental pain, and producing sleep. I believe that in the worst types of these cases, those which have great prostration and depressed nervous and vascular systems, with a dry coated tongue, opiates are not safe or appropriate remedies. The same may be said of chloral in this and all depressed delirious states. I am quite confident that I once saw the heart suddenly stop beating in a patient with delirium tremens from a large dose of chloral hydrate. The only safe rule seems to me to be that where there is a fair state of the vascular and digestive systems, but with great motorial excitement and inability to sleep, as in some forms of mania, or with much psychic pain and consequent agitation and insomnia, as in some forms of melancholia, a single full dose of morphia may be given in the attempt to procure a night's rest, but it ought not to be indiscriminately repeated in a routine treatment by nurses and attendants. This form of melancholia will be more likely to be benefited by this treatment than the maniac, who even after a prolonged morphia sleep is apt to wake up as excited as ever. Hyoseyamine has been tried and approved by some observers, notably by Dr. H. M. Wetherill of the Pennsylvania Hospital for the Insane. In an extensive series of observations of various forms of excitement he was led to believe that the sleep thus obtained was more complete and refreshing, and less attended and followed by inconvenient results, than that obtained from any other drug. The bromide salts are the least objectionable, probably because they are the least efficacious. I do not think they are of much service: they are certainly not good hypnotics. Perhaps they may have some control over cases with great muscular unrest. At the Philadelphia Hospital we have used paraldehyde with some advantage in cases of mania, even of a severe form. This drug, in doses of from one to two drachms, does not appear to be attended with any unpleasant effects. Since the days of Paracelsus camphor has been landed for its calming action in these disorders, because apparently of its supposed antaphrodisiac qualities; and this is only of service now as showing how extensive the belief has been of sexual perversions in these cases. Different kinds of baths may be important aids to treatment in some of these forms of insanity, but I have had little experience with them. Stimulants may and ought to be given when the pulse is weak and the nutrition feeble. They are to be given for their effect upon the physical rather than the mental state of the patient, if the distinction may be made. In cases with any septic infection the principles of antiseptic obstetrics ought to be most carefully applied. I think enough has

been shown in this paper to make the necessity clear for a careful search for this element, and prompt treatment of it when found. The imperative necessity of removing pieces of adherent placenta cannot be emphasized too much. In such a case the interior of the womb ought to be curetted, and irrigated with some antiseptic lotion. I think quinine is of value in those cases of sepsis with a rising temperature, but I do not know that it acts as a specific, as some appear to believe. Bleeding, blisters, and salivation, as recommended by Rush,¹ are mentioned only to be condemned.

The question of inducing premature labor may arise in some of these cases, especially when the physical condition is bad, as in grave anæmia. In the case of Dr. Hirst, already described, labor was induced because of the debilitated state of the blood and the prostrated mental condition, but the patient was not benefited. I cannot believe that this measure will ever be of advantage, unless it be in these cases of profound anæmia with persistent vomiting. It might be possible thus to avert what threatens to be a fatal issue; and the fact that the patient does not immediately begin to improve in her mental symptoms cannot be quoted against the procedure. In pure psychoses premature labor would not be likely to have any influence in effecting a cure; in fact, the moral effect of the necessary manipulation might be all the more injurious. In cases of delirium and uncontrollable conduct occurring during the close of the second stage of labor, such as have been quoted above, the duty of the physician is to terminate labor with the forceps, under anæsthesia, as soon as possible.

THE INFLUENCE OF PREGNANCY, PARTURITION, AND LACTATION ON INSANITY.

This aspect of our subject is of some interest, and has been thought by a few writers to have practical importance. They suppose that the prognosis of some cases of insanity may be rendered more favorable by one or all of these states. Berger, in his early tract, attributed to abortions a curative value, although the same accident, he says, may also determine an explosion of insanity. Erasmus Darwin² advises that the child be brought frequently to the mother and applied to the breast, as this often excites the "storgé," or maternal affection. Esquirol recognizes the fact that these conditions sometimes favorably affect mental diseases, but regards these cases as exceptions, as he had frequently seen insanity persist and even be aggravated by them. Guislain says that pregnancy influences sometimes neither for good nor evil the mental

¹ Letter to Dr. Spence, replying to one from the latter relating a case of puerperal mania, *Phila. Med. Museum*, 1808, vol. iv. No. 3, p. 129.

² *Zoonomia*, vol. iv. p. 70.

condition of the insane, but that in cases of periodical insanity it can arrest in some cases the development of the mental disease. He knew a patient who was insane almost all the time, but who recovered her reason during the whole of her gestation. Griesinger refers to a similar case of his own in which a mental affection disappeared with each pregnancy. Marcé concludes that childbearing modifies happily certain exceptional cases, and attributes the fact to the reawakening of the maternal instinct by lactation. I have observed a number of cases of pregnancy in insane women. We have several patients now in the Philadelphia Hospital who have been delivered in the insane department. I have not seen any permanent favorable result in any of these cases, unless it was in the following: A young German woman, aged twenty-seven, was admitted in her fourth pregnancy. She had delusions of persecution, and was violent and obscene. She had attacked her mother, threatening to kill her, and had attempted to set fire to the house. She alternated between these sullen and violent spells and periods of quiet good-nature. She was calm and tractable during a slow labor, permitting an examination, although she did talk about choking the doctor. For the first twenty-four hours she allowed the babe to nurse her, but showed no fondness for it. It then became necessary to fasten her in bed, as she insisted upon getting up and would not remain covered. Two weeks after delivery she became more quiet and subdued, and has so remained. This patient had had an alleged sunstroke when fifteen years old: there was an hysterical element in her case, aggravated by abuse from her husband. Two other patients seemed temporarily pleased with their newborn babes, but were very ready to part with them; so that the maternal instinct in these women was at best but feeble and short-lived. If there are any persons who, under the influence of a popular delusion, recommend pregnancy as a cure for insanity, they may reflect that they are not sustained by the great body of recorded facts and the wisest reasoning of experienced alienists on this subject. It is not probable that such a fallacy can be very prevalent at this time. But neither are those better justified, it seems to me, who advise matrimony as a panacea for the neurotic diathesis. Women of this constitution do not bear well the burdens of maternity, and their offspring are not apt to be the most valuable contributions to society.

THE MEDICO-LEGAL ASPECTS OF THE INSANITIES OF PREGNANCY, THE PUERPERIUM, AND LACTATION.

The legal responsibility of pregnant and parturient women in the various psychoses to which they are subject has been, and will continue to be, a nice question of casuistry for the courts. The unfortunate

woman who kills her child in an access of acute delirium, and the victim of melancholia who kills herself to escape the burden of her profound psychalgia, do not furnish complex problems to tax the judgment or the charity of mankind: the nature of their cases is usually too evident to admit of a doubt that reason has been dethroned, that the will-power, the self-consciousness, has been weakened or perverted, or the emotions disturbed quite beyond the endurance and equipoise of the mind. But there is a wide range of cases in these two conditions in which the consciousness and reason of the patients are not so overwhelmed as in mania or the emotions so depressed as in melancholia. They are the cases, already referred to, in which the whims, caprices, and morbid dispositions, appetites, and longings of the pregnant woman, or the impulses and frenzies of the parturient one, place these patients on the border-line, as it were, between sanity and insanity, or constitute such a technical and indistinct type of alienation that in the practical demands of medical jurisprudence the opinions of physicians vary, and the jury is apt to decide the case according to their sympathies or the prevailing current of public opinion. Fiction has portrayed these cases, and the public which has wept over the misfortunes of Effie Deans and Hettie Sorel is apt to have a ready sympathy, not inappropriate, for these interesting and appealing women. I think that the psychology of these cases varies, and that the degree of guilt, therefore, cannot be made measurable by any fixed rule. Some women entertain a strong aversion to their unborn babes: these are especially cases of illegitimacy, in which the mother comes to regard the infant as the source, the evidence, and the penalty of her own shame. In some peculiar circumstances this aversion is intensified, and cannot be corrected by any moral appeals. I have seen a striking instance of this. I once had under my care a young woman from a large circle of brothers and sisters, and of a highly respected family, who became pregnant in an amour with a negro servant. She had the most intense disgust for her unborn babe, would not speak of it or prepare for it, and after its birth refused persistently to see it, to nurse it, or to have it brought near her. When we consider the social penalty for such offences we cannot wonder that some of these poor Magdalens, in a frenzy of terror and despair, unattended in the agony of their parturition, uncomfited and unsupported, either abandon their helpless offspring or destroy them in a paroxysm of rage and fear. These cases can scarcely be called instances of delirium, such as happens under the influence of acute pain and great prostration, and which may occur in women who have the happiest domestic and social surroundings; but they are the cases which have oftenest contributed to the annals of medical jurisprudence. Esquirol presents the case of a young woman who becomes illegitimately pregnant, does not conceal it, and makes preparations, is confined during

the night, and on the following day is found in her bed and the child in the privy with twenty-one wounds from a pair of scissors. She avows her crime, does not defend herself, manifests no regret, but refuses to eat. Esquirol supposes her to be insane, but I think the mental processes in her case are probably indicated above, and the measure of her guilt must be left to the compromises and sophisms of the courts. Marcé gives a case from the assize court of Marne (1847) of a young woman who had killed her babe by tightening a cord around its neck: she claimed that she was out of her mind, and a compliant jury acquitted her. Boileau de Castlenau¹ gives the case of a young woman who mutilated her infant in a shocking and useless way on the head, back, belly, and limbs, cutting off the head and concealing the bleeding fragments. The jury admitted the extenuating circumstances. This appears to have been simply a desperate and brutal attempt of the patient to conceal her shame. Some years ago a woman named Hester Vaughn was convicted in Philadelphia of infanticide, but public aversion to her execution was so great that the case was compromised and the woman sent to England, whence she had come.

The impulsiveness of the acts of violence which characterizes some of these medico-legal cases has been already referred to. This impulsiveness, however, while in some cases it may be very apparent in the act itself, does not prove that the suggestion of this act may not have lain in the mind for some time, and have been resisted and controlled by the patient until the will-power has suddenly given way before the pressure of a fixed idea. This is of importance in the legal aspect of these cases, because it may possibly be shown, as Taylor suggests,² that the patient knew what she was about, and had even requested that the child be taken from her lest she should kill it. This superficial appearance of sanity might have some influence upon the legal mind, and give rise to the specious reasoning that a patient who had such an accurate self-knowledge and prescience could not be irresponsibly insane. Of course such reasoning is false: the morbid impulse, the fixed idea, is in itself one of the symptoms of insanity, which may readily come within the patient's self-consciousness before her mind falls into the confusion of delirium, or even in cases where no well-defined delirium follows; and the subversion of the patient's will-power to such an impulse in the commission of some criminal and unnatural act is only an additional evidence of the extent of her alienation. Morel relates a case of fixed idea produced in a young nursing woman by reading the reports of criminal trials wherein it was said that women were sometimes seized with irresistible impulses to kill their children. She became so filled with this idea that her nursing child had to be taken from her. In those

¹ *An. d' Hyg. pub. et méd. Leg.*, xlv. p. 437.

² *Manual of Med. Jurisp.*, edited by Reese, Philada., 1873.

cases in which the impulsive homicidal act has been attempted or committed during the maniacal excitement or just after the cessation of a paroxysm, as in Dr. Townsend's case, already narrated, it is very probable that the deed is in response, sometimes at least, to some such idea which has lain fragmentary or confused in the patient's mind from an earlier period of her malady. Some authors, among them McLeod, say that patients are prone to make unfounded accusations of assault and immorality with much plausibility and circumstantial detail. Rocher refutes Tardieu, who rejects the claim of transitory mania, and Legrand du Saulle, who says the reported cases are allied to epilepsy of a masked type. The latter assumption appears to me to be entirely unfounded. Rocher believes that the causes which produce transitory mania during delivery are shame over an illegitimate birth, heredity, and the nerve-instability of the puerperal state, and in some the extreme pains of labor. Among those who favor the existence of such transitory mania are Morel, Griesinger, and Kraepelin. According to Taylor, irresponsibility on the ground of transitory mania under these circumstances has not been admitted in any English court.

The following case was of some special medico-legal interest; we had the patient in the Philadelphia Hospital at the time, and it thus happened that I was asked to give testimony about her in court: The husband of a Jewish woman asserted that she had always been sane until she sailed for America, and that harsh treatment on shipboard had deprived her of her reason. He claimed damages of the steamship company. The defence proved that she had had an attack of puerperal mania seventeen years before, and had been treated in one of the English county asylums, producing certified copies of the old papers of commitment, certificate, etc. to Cheadle Asylum. The plaintiff's case fell to pieces on this evidence. The woman was markedly chronic in appearance and symptoms, and had evidently never recovered from her primary attack of puerperal insanity.

Some of the most important questions in the medical jurisprudence of the puerperium arise in reference to delusions or alleged delusions of the patient. The fact that some of these patients may make unfounded accusations of immoral conduct has been already stated; but the fact that they may also occasionally make truthful confessions under the influence of emotional excitement and moral stress has not been so generally recognized. The obligation to distinguish these facts is great, and the importance to the patient and her family of doing so cannot be over-estimated. It is very evident that to so distinguish must sometimes be a task of great difficulty. I do not doubt that insane people may sometimes tell unpleasant truths, and that interested friends may find it convenient to have such statements interpreted as delusions. A woman in one of the interior counties of Pennsylvania recently, in

puerperal delirium, revealed the fact that she had another husband living. This was apparently not a delusion, as investigation, it is reported, proved the truth of the confession. The most notable of these cases, among all *causes célèbres*, was the Mordaunt case¹ in England. The wife of an English baronet confessed soon after her confinement, and in the commencement of what appears to have been an attack of puerperal insanity, that she had been an unfaithful wife and that the child was not her husband's. She implicated a number of men well known in the social world. A trial resulted, which is unsurpassed in the unsavory scandal and serious consequences which arose from it. The collateral evidence, which confirmed the patient's statements and compromised her still more, does not appear to have been refuted, while, on the other hand, the testimony of some of the most eminent alienists and practitioners leaves no doubt that after her confession the patient sank into a state of insanity. The conclusion seems inevitable that the woman made a truthful confession in the initial stages of an attack of insanity.

The morbid cravings and desires of pregnant women have contributed something to the annals of legal medicine. Rocher speaks of the connection of "kleptomania" and pregnancy. He says medical jurists are sometimes called upon to pronounce upon such cases, and refers to Marc, who has some reflections on this subject and this proposition: "Can a woman imprisoned for stealing give as an excuse a longing of pregnancy?" The terms "kleptomania" and "pyromania," as applied to special so-called forms of insanity, are very artificial and inexact: it is true, however, that they indicate some special features and tendencies of a class of psychoses which are closely allied to monomania. These tendencies may show themselves in pregnant women, especially in those with an hereditary predisposition to insanity. The following case from Casper² illustrates this subject and may close this discussion: He relates an instance of theft alleged to be produced by the longing of a pregnant woman. He admits that it was unquestionable, and determined that the patient during her pregnancy had a longing for bright objects. In this state she stole some small objects from the jewellers' shops. She had exhibited a remarkable alteration in her mind soon after the commencement of her pregnancy, which was her first. She was absent and forgetful. She had taken bright objects from her friends, who recognized that it was the result of her condition and had treated it as an idiosyncrasy and indulged it accordingly. Her mind was obscured by her pregnant state. In spite of these acknowledged facts, Casper says that the conclusion was reached that the alleged longing was not irresistible, because the patient recognized and

¹ *Official Report*, Mordaunt v. Mordaunt.

² *Handbook of Forensic Medicine*, vol. iv. p. 308.

had tried sometimes to combat it—that she had lied about it, and that therefore it had not morbidly impelled her to commit these thefts; therefore she must be regarded as a responsible agent. The results were the punishment of the lady, her divorce, and after a lapse of years, and at a time when she was not pregnant, another theft of a piece of silk. It is thus criminals are made. Comments are unnecessary.

II. OCCASIONAL NEUROSES OF PREGNANCY AND THE PUERPERIUM.—CEREBRAL EMBOLISM AND HEMORRHAGE.

THE childbearing woman is subject to a variety of lesions of the cerebro-spinal system, besides the psychoses already described in the preceding paper, which merit separate and distinct mention in the present system. Prominent among these are chorea, eclampsia, rarely tetanus, and hemorrhage and embolus of the cerebral vessels. Epilepsy is an occasional coincident. Eclampsia has been described by another contributor. The others will be briefly reviewed, with some original observations, in the present paper.

THE CHOREA OF PREGNANCY.

DEFINITION.—The disease about to be described is usually a severe form of chorea occurring in pregnant women. In its clinical form it has no special characteristics to distinguish it from the simple, idiopathic chorea of childhood and early adolescence, but it presents some special features in its etiology, the severity of its type, the gravity of its prognosis, and the vexed questions of its treatment. It is therefore deserving of distinct consideration in a system devoted to a complete science and art of obstetrics. It cannot, however, be studied with profit apart from the general subject of chorea as observed in all other conditions, because it is doubtless intimately associated with that in its causation and pathology, while, as before intimated, it is practically identical with it in its symptomatology. The term “chorea” has been variously applied by writers, since it is one of those unfortunate words in nosology which do not represent a definite and recognizable disease-process. It is well, therefore, to define it at once as used in this connection. Chorea is a disease of the motor or neuro-muscular system, characterized by a series of involuntary, inco-ordinate movements of the face, tongue, neck, trunk, and extremities, very little under control

of the patient's will, often made worse by voluntary efforts, persisting during waking hours, usually ceasing during sleep, and associated with or followed at times by more or less loss of power in the affected muscles, and, in severe cases, with a relative prostration of strength and feebleness or affection of the mind. This disease has no necessary connection with the so-called "chorea major," which is a term applied to a group of nondescript convulsive and acquired movements of endless variety usually observed in hysterical subjects or those under some special exciting influence, as religious revivals, endemic and imitative impulses, etc., and which are often distinctly rhythmical and purposive, or of the nature of an acquired, artificial, or automatic trick or dexterity.¹ Some forms of involuntary or myoclonic shocks, not properly choreic, are described, as well as the convulsive ties, which are not inco-ordinate; but none of these rather rare forms are apt to be associated with pregnancy.

It is not desirable, in this connection, to attempt a history of the true chorea. Sydenham gave a brief but admirable description of it, and subsequent writers finally differentiated it from the many indefinite and acquired disorders already referred to. Its place is fixed: only its pathology claims the interest of the school now in vogue.

CAUSES.—The meanings attached to this term by different writers are so variable that it is somewhat difficult to select that one condition or phenomenon in the successive links of cause and effect which will be most acceptable as the most common and universal. Thus, it has been customary to say that rheumatism is a cause of chorea: and there can be no doubt that it is a frequent antecedent and an occasional coincident of the disease. But we know that no very definite idea can be attached to the word "rheumatism" as indicating a disease-cause or essence, although certain inflammatory states of serous membranes are easily recognized which are called rheumatic. Hence it appears that really one of these inflamed membranes—the endocardium—is supposed to be the cause of chorea by reason of the emboli which are washed off from it and carried to the capillary system in the brain. As this is properly a question in pathology, it is discussed under that head. This embolic theory, however, does not satisfactorily explain all cases of chorea, because very many patients with chorea have never had rheumatism; therefore, some have supposed that the exanthemata may cause the endocarditis, and thus they still attempt to hold to this theory. Again, this obscure and unknown disease-poison, rheumatism, is said to be the common immediate cause of both the endocardial changes and the chorea, but how it acts is not explained. In the report of the collective investigation committee of the British Medical

¹ For a discussion of the varieties and diagnosis of chorea see Guinon, *Gaz. des Hôpitaux*, 1887.

Association only about 25 per cent. of cases of chorea had had undoubted rheumatism. I have no statistics, but it has been the commonest thing in my observation to find no evidence or history of rheumatism.

Certain peripheral irritations have been looked upon as causes of chorea, prominent among them being pregnancy and intestinal worms; so also a tight prepucæ, and again insufficiency of some ocular muscles. Pregnancy no doubt acts as an exciting cause: this is its true relation to the disease as we are now considering it, but *how* it acts must remain a mystery for the present at least. It is quite impossible to give statistics showing the relative frequency of this cause. To do this it would be necessary to know the number of cases of chorea happening in the total number of pregnancies and the number of cases of pregnancy happening in the total number of choreas. Such figures are not forthcoming. The association of rheumatism and pregnancy as conjoint causes of chorea seems to be indicated by the fact that a certain number of cases exhibit both these etiological factors.

Emotional disturbance or shock has been supposed to be an exciting cause. In some of these cases, happening during pregnancy, this etiology has been strikingly indicated: several such cases are referred to in this paper. In the simple chorea of childhood this element seems to have been present sometimes.

Previous attacks of chorea during childhood in persons who afterward develop the disease in pregnancy are recorded in some cases. In such cases a predisposition to the disease appears to have existed which required only an exciting cause.

It thus appears, with our present knowledge, that the true causation of chorea, especially in pregnancy, cannot be definitely stated. We can recognize certain antecedents, as rheumatism, shock, and pregnancy, but how such diverse causes can act to produce such a characteristic and always distinct disease has nowhere by any person been satisfactorily explained.

· SYMPTOMS.—The description which Sydenham gives of the choreic patient is unsurpassed, as far as it goes, by the more elaborate efforts of modern authors: "This disorder is a kind of convulsion, which chiefly attacks children of both sexes, from ten to fourteen years of age. It first shows itself by a certain lameness, or rather unsteadiness of one leg, which the patient draws after him like an idiot, and afterwards affects the hand of the same side, which, being brought to the breast, or any other part, cannot be held in the same posture a moment, but it is distorted, or snatched by a kind of convulsion into a different posture and place, notwithstanding all his efforts to the contrary. If a glass of liquor be put into his hand to drink, he uses a thousand odd gestures before he can get it to his mouth; for not being

able to carry it in a straight line thereto, because his hand is drawn different ways by the convulsion, as soon as it has happily reached his lips, he throws it suddenly into his mouth, and drinks it very hastily, as if he only meant to divert the spectators.”¹ In this brief and concise sketch the author not only happily describes and illustrates the convulsive movement, but also distinctly indicates that the affection is often unilateral—a fact which, as will be seen, has been much relied upon by some recent pathologists to sustain their particular views of the nature of the disease. Chorea, then, as seen under all circumstances, is a disease marked by irregular, involuntary, clonic spasms of individual muscles, or more often physiological groups of muscles, sometimes general, but frequently most apparent on one side, or occasionally more noticeable in the arms than in the legs. The irregular and inco-ordinate character of these spasms is one of their distinctive marks. They do not follow each other in any regular order or sequence of time or location, one group of muscles throwing the limb first in one direction and then another group quickly jerking it in another. While this is in the main true, I think I have been able to note on close observation that there is some similarity in the repeated movements if watched for some length of time. The fact that the affected muscles are often those which are constantly associated in complex physiological processes gives to these movements sometimes a partial resemblance to voluntary or purposive acts awkwardly performed; and the real voluntary acts performed by the patient are much embarrassed by the increased choreic movements excited by the volition. In long-standing cases, however, some patients seem to gain a certain dexterity in eluding, as it were, rather than controlling, the irregular spasms, and thus may be able to do some things requiring precision of movement. The range of the movements is wide, thus differing from the small, fine action of a tremor or the weak, sluggish motion of a fibrillary contraction. They have no rhythm, thus differing very notably from the constant and regular movement of paralysis agitans. These spasms, again, are constant during waking hours, and are entirely independent of volition; that is, they continue while the patient is making no exercise of will-power. This is an important clinical distinction, because it helps to differentiate chorea from the irregular, atonic movements of disseminated sclerosis of the cerebro-spinal axis, which movements are observed on volition only; and this distinction may have pathological significance, which, however, we are not yet able to interpret. It is commonly observed that chorea is often confined to, or more marked on, one side; occasionally one limb or the muscles of the face and eyebrows are most involved. I am sure that I have seen it most marked in the arms, face, and trunk in cases

¹ The entire *Works*, etc., London, 1763: “*Schedula Monitoria*,” etc., p. 552.
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in which the legs were only slightly affected. Thus, in a case of long standing which I recently specially observed in reference to this fact the arms were constantly jerked about, the forearm alternately pronated and supinated, the fingers moved somewhat as in athetosis, the face worked, the eyes opened and shut, the tongue protruded in choreic jerks, and the body twisted about on the chair with a squirming motion; and yet the legs were but little affected, but they were not exempt.

The sensory symptoms in chorea are often not at all marked: the disease, as has been said, is one of the motor side of the nervous system, and hence the sensory symptoms which occur are only those which are secondary to the violent agitation and unrest of the muscles. Thus, there are occasionally pain and aching in the limbs, and a general sense of soreness and weariness, which are evidently caused by the constant involuntary movements. Anæsthesia and altered states of sensation are not observed, or, at least, not generally. Some observers, I believe, have found some patches of anæsthesia; but when the difficulty of making satisfactory tests in these cases is considered, as well as the fact that the results must be taken from the observation of the patients themselves, many of whom are certainly not in a mental or motor state favorable to exact observation, these results may be regarded as questionable at least.

The nutrition of the choreic patient under all circumstances and from whatever causes is apt to be impaired. Anæmia is very commonly observed, with an attendant loss of weight. In the cases occurring in pregnant women this altered state of the blood is especially found. The tendency to anæmia in pregnancy under some circumstances is a topic of great interest and importance, and has been already referred to at some length in the preceding paper on "Puerperal Insanity." In all the cases of chorea happening during pregnancy which I have seen the anæmia has always been evident, as well as loss of flesh and a general—sometimes rapid—prostration of strength.

The violence and range of the movements vary in different cases, but the type of the cases occurring during pregnancy is apt to be severe; in fact, the most severe cases of chorea observed appear to have been those of pregnant women. In a very large number of cases of chorea observed by me I have never seen any to compare in violence and extravagance of movement with two cases—one of a man with hereditary chorea, and the second of a woman with chorea in the fourth month of pregnancy. In some instances the poor victim of this strange malady cannot be restrained in bed as she throws herself about in the contortions and convulsions over which she can exert no effectual control. In these extreme cases sleep, as well as nutrition, is much

interfered with, and the urgent demand and desire for this add much to the patient's distress. Appetite, with the ability to assimilate food, is of course impaired. The action of the heart may be disordered: in the first place, in cases with a rheumatic history, the heart-valves may be damaged, and again, in cases which present no organic valvular disease, some observers claim to have found a genuine choreic irregularity in the action of the heart-muscle. The latter alleged fact is doubtful, but it is true that the heart's action in many cases is weak and rapid.

The tendency to abortion and premature labor in the chorea of pregnancy must never be lost sight of. Statistics and the reports of individual observers show that this tendency is quite marked. Some writers have indulged in speculations as to the cause of this; but certainly any one who has had the opportunity, and has attentively observed a case of severe chorea in a pregnant woman, has not far to go to find an explanation. The wonder rather is that all these women do not abort, and abort quickly—that the gravid uterus can continue for even the shortest time to retain its contents amidst the general motor disorder. In these severe cases not only the limbs, but the muscles of the trunk—both back and abdomen—are in constant, irregular, and violent action, the latter exerting compression upon, and dealing blows and shocks to, the enlarged womb. In addition, the patient is in a more or less prostrated physical state, taking insufficient nourishment, and hence starving the fetus. In these facts, then, appear very evident reasons why, after a while, in many cases the womb gives way and abortion occurs. The duration of the symptoms is not always coincident with the pregnancy. In some cases the disease has been controlled or has ceased before term, while in other cases the symptoms have persisted for shorter or longer periods after labor. A very few cases of chorea have been reported which did not make their appearance until after confinement. In the largest number of cases the initial symptoms are observed in the first half of pregnancy.

Motor weakness, even to the extent of paralysis, sometimes accompanies or follows chorea. It is especially observed in the cases of unilateral or hemichorea, probably because in these cases the paresis is more marked in contrast with the sound side. Recovery from it usually occurs soon after the cessation of the abnormal movements. Some pathologists, who believe that chorea is caused by minute emboli in the capillaries of the central nervous system, cite this paresis as additional evidence of such organic changes: on the other hand, it has been regarded as merely an exhausted state of the muscles caused by their over-action.

In a case which I once attended the patient not only had an extreme anæmia and prostration, but suffered with an extensive and obstinate

abscess of the mammary gland. I have not seen this mentioned as a complication in any reported cases, although two of Ogle's¹ fatal cases had abscesses in other parts of the body. The patient was a young primipara, suspected to be illegitimately pregnant, although this was denied; at any rate, she was not living with her husband. There was also reason to suspect syphilitic infection. Her chorea began in about the third month of pregnancy, and was very severe. At its height the girl was kept in bed with difficulty. The movements were general, the muscles of the face, tongue, neck, trunk, and limbs being actively convulsed. Her speech was so affected that it was sometimes difficult to understand her. Her mind was evidently weakened and changed, although she did not show any delusional or maniacal states. When her disease had continued for several weeks, she complained of pain in the left breast, which was found swollen and inflamed, just as is observed sometimes after labor. There had been no previous signs of milk in her breast, nor was any found then or subsequently in either the inflamed or sound gland. The inflammation went on to active suppuration, which required a number of incisions for the evacuation of the pus. The sinuses formed were not easily healed, the matter was thin in appearance, and the general aspect of the inflammation was not very healthy. The question arose at the time whether this abscess was the effect of some traumatism self-inflicted by the patient in her numerous involuntary and uncontrollable movements; and I believe that this is the correct explanation of its origin, while its special features may be accounted for by the patient's debilitated condition.

Dr. William Goodell has recorded² a fatal case of chorea happening in his own practice which had some special and remarkable symptoms. This patient also was a young primipara illegitimately pregnant, although married during her early pregnancy. She had a history of several previous attacks of chorea during childhood, one following scarlet fever, another following rheumatism, and a third being caused by the shock of her father's sudden death. The initial symptoms of her last chorea began at quickening, and were unilateral, but the movements subsequently became general. Premature labor at the eighth month came on. It required the united aid of three persons to permit the physician to make a vaginal examination, and the choreic movements were so violent that all these attendants could not keep the patient on the bed, so that it became necessary to spread blankets on the floor and to deliver her on these. She had a series of the most wonderful muscular movements—now nearly striking the nape of her neck with her heels, now almost hitting her chin with her toes, at the same time throwing her arms about in every conceivable manner,

¹ *B. and F. Med.-Chir. Rev.*, vol. xli., 1868.

² *Am. Journ. Obstet.*, vol. iii. p. 140.

and rapidly protruding and withdrawing her tongue, which, however, she never bit. In a position of rigid opisthotonos she would roll over sideways or diagonally, sometimes making complete somersaults, dashing her head, her arms, her legs, first on one wall and then on the other of the narrow room. During this time she never spoke, but at long intervals uttered a wild scream; yet intelligence was not wanting, for she kept her eyes constantly fixed on her physician, as if imploring rescue from the clutches of some invisible demon. Ether, chloral, and the bromides had but little effect to control the movements: chloroform did better, aided by morphia under the skin. After labor the frightful contortions returned: the pins of the binder were torn out, and, although the hemorrhage was not excessive, she soon managed to smear with blood her person, her bed and bed-clothes, and the wall to a height of three feet. This patient lingered two days, and died of exhaustion, the choreic movements not ceasing until they were lost in the coma preceding dissolution. This case illustrates the fact that some of these patients are old choreic cases, who have suffered with the disease during childhood or in previous pregnancies, and that pregnancy is only one of a number of exciting or predisposing causes. These facts seem to disprove the theories which attribute chorea to some one special pathological state, such as capillary embolism following rheumatic endocarditis.

In some cases the choreic movements have been comparatively slight until labor set in, when they have become suddenly much worse, the patients dying of exhaustion.

The urine in chorea is said to be always dense with urates and phosphates, and the presence of these salts is explained by the great waste of muscular and nervous tissue accompanying this disease. Retention and incontinence of urine are mentioned by a very few observers¹ as having occurred in some cases. Incontinence has been known, so it is said, to interchange with chorea of the external muscles.

Some observers have thought that a connection exists at times between chorea and other neuroses, and that the symptoms of these latter may accompany or complicate the former. The diseases especially mentioned are hysteria, epilepsy, paralysis agitans, and paralysis. It is undoubted that choreic patients exhibit frequent emotional disturbances which may be regarded as hysteroidal, but these are probably the natural effects of the tormenting disease from which they suffer. Genuine epilepsy as a result or complication of chorea has never been observed by me, and I cannot recall a well-authenticated case on record: so, too, of paralysis agitans, which, however, while perfectly distinct in the character of its movement and its clinical history, might be confounded by a careless or inexperienced observer with some

¹ See Ogle: *op. cit.*

form of chorea. Paralysis, in varying degrees, is an undoubted accompaniment or sequela of chorea: whether directly caused by the same lesion of the central nervous system or simply by the over-action of the convulsed muscles is an open question.

The mental health of the choreic patient is not unusually affected. This aspect of the subject has both clinical and pathological interest: it can scarcely fail to attract the attention of observers, and so to constitute an important and characteristic symptom-group, while it has been especially appealed to by some pathologists to support their views of the morbid process occurring in this disease. The special alteration which I have observed in chorea is a certain weakness, fatuity, or absence of mind, which is but slight in the majority of cases, and which is probably a secondary effect of the peculiarly harassing and absorbing nature of the symptoms. A child or a woman who is depressed in health, anæmic, the result of anorexia and insomnia, and the victim of a ceaseless and annoying malady, which distracts the attention from everything profitable and concentrates it upon the immediate discomforts of the hour—who is, moreover, a conspicuous object of curiosity or amusement to every idle observer—naturally becomes somewhat changed in character, shy and depressed, listless, or even weakened in the exercise of the true cerebral functions. This, then, has been the state most frequently observed, and which Sydenham refers to as that of an “idiot.” This state, however, may be erroneously attributed to some cases, and for the following reason: the constant jactitation of the patient, with the grotesque gestures and odd and foolish grimaces, simulating purposive acts, gives to the countenance and general deportment an appearance of weakness and imbecility which is superficial and misleading. It may therefore be unjust to ascribe to these involuntary movements the actual significance which they would have in health. In some cases I have seen the countenances of the victims haggard and downcast, and in very many of them wearing this semblance of mental prostration.

More serious psychoses, however, are occasionally observed, although they appear to be rare. In the report of the collective investigation committee of the British Medical Association 439 cases of chorea are analyzed, and of this number 3 were complicated with hysteria, 2 with emotional disturbance, 1 with ungovernable temper, and 1 with delirium. These cases were not necessarily associated with pregnancy, as the list includes chorea from all causes. Active mania has been seen in grave choreic cases as well as states with hallucinations. As the chorea of pregnancy is of a severe kind, it is probable that some of these grave mental affections may occur in this class of cases with more relative frequency than in simple cases. Schuchardt¹ has recently

¹ *Allg. Zeit. f. Psych.*, 1887.

given some illustrative cases of the connection of chorea and mental symptoms. In one the choreic and mental symptoms were the combined product of lead-poisoning; in others the following symptoms were present: idiopathic chorea, followed by a change of character, mania, and hallucinations, terminating in dementia. Marcé has written¹ a careful analytical paper on this aspect of our subject founded upon the observation of 57 cases of all ages and both sexes, and draws the following conclusions: Two-thirds of the cases had affections of the intellectual and moral faculties; these alterations are four: (1) change of character, irritability, and an unusual tendency to gayety or sadness; (2) affection of the intelligence characterized by loss of memory, instability of ideas, and impossibility of fixing the attention; (3) hallucinations, coming on especially in the evening in the intermediate state between waking and sleep, affecting especially the sense of sight, and associated particularly with hysteroid symptoms; (4) maniacal delirium, a very grave complication, which may end in death, or in other cases may leave after it divers mental troubles of variable duration. Some of the mental complications recorded in the books have probably been observed in cases of the so-called "chorea major" rather than in true chorea: these are especially hysterical, automatic, and imitative phenomena. The following case is one of special interest: it has been observed by me in the Pennsylvania Hospital for the Insane, under the care of Dr. John B. Chapin: Mrs. —, aged 25, was admitted five weeks after the first symptoms of insanity appeared. Prior to her marriage, about six years before, the patient was known to be hysterical, with exacerbations of excitement at the approach of and during the menstrual periods. After her marriage this condition increased, and especially after the birth of her two children. Chorea developed soon after the birth of her first child, five years before the insanity, and has continued steadily to advance. The first symptom of insanity was observed when she discovered that she was taking arsenic for her chorea: she immediately conceived the delusion that her husband was trying to poison her, and she has continued since to refuse all medicines. Other delusions followed, as that her children have been murdered by their father, although she occasionally sees the children alive and well. She has a sense of fear and apprehension of personal danger from her husband. She is in part demented; her memory is impaired, she is confused and silly, laughs impulsively, hysterically, and without cause, and sheds tears. She has sometimes refused to take food, under the impression that her husband poisons it. Upon admission she required to be assisted from the carriage into the house by two persons, one supporting her on either side, her limbs jerking about so much that locomotion was almost impossible. At

¹ "De l'État Ment. dans la Chorée," *Mém. l'Acad. Imp. Méd.*, tom. xxiv.

present her articulation is much impaired, as well as her writing, the pencil staggering about and finally flying from her grasp. The entire muscular system of the head, neck, trunk, and limbs is contorted by a series of jerking movements quite beyond her control. Occasionally, as she lies in bed, a wave of convulsive movement passes through the entire system. The heart's action is rendered quick and irregular in force and rhythm by the least effort or excitement. The tongue is protruded with a jerk, and is in constant irregular movement. The limbs twitch about when she is asleep.

PATHOLOGY.—An attempt to review and criticise all the various speculations which have passed for knowledge of this subject is quite impossible within the scope of this article. None of these have contributed much definite and practical information, unless it has been to indicate an etiological relation, not thoroughly understood, of rheumatism and some of the eruptive fevers to chorea. It is not necessary to allude to the vague and inexact language in which it was formerly so often the custom to convey opinions about the pathology of all nervous diseases. These, and chorea among them, were said to be due to "irritability" or "depression" or "reflex action" according as the individual fancy or the prevailing fashion dictated. Such terms convey no complete and definite ideas. Prominent among all the theories which have been advanced to explain the cause and disease-process of chorea is the one which ascribes it to rheumatic inflammation of the valves of the heart acting by minute emboli, which, becoming detached, are conveyed by the blood-current to the capillary system in the brain. Copland¹ claimed to be the first to point out this relation, although he did not originate the embolic theory. He says that the complication of chorea with rheumatism, rheumatic pericarditis, and disease of the membranes of the spine was first demonstrated by him in a post-mortem examination which he published. Bright, according to Tuckwell, attempted to explain this relation by supposing that the pericarditis propagated an irritation along the phrenic nerve to the spinal cord, from which it was violently reflected along the motor nerves to the muscles of the body. Later, most writers appear to have been satisfied with saying that the chorea, the heart complications, and the mental changes were due to one common cause, rheumatism, until it appeared incontestable, after numerous clinical observations, that very many of these choreic cases had no antecedent history of rheumatism whatever. This difficulty was in a manner surmounted by Kirkes,² who published two papers in 1863, in which he repeats what he says he claimed in 1850—his belief in the relation of inflammation of the cardiac *valves* to chorea, which is founded on the facts that a murmur exists frequently, if not *invariably*, in chorea, and that fatal cases of the disease present post-

¹ *Dictionary*, art. "Chorea."

² *Med. Times and Gaz.*, 1863, pp. 636 and 662.

mortem evidence of inflammation of the valves or the left side of the heart. He gives the details of a fatal case of chorea in a pregnant woman in which the autopsy revealed minute vegetations on the valves of the heart as well as small capillary engorgements in the central nervous system. This appears to have been the début of the embolic theory; and Dr. Kirkes is to be credited with having been the first to indicate that chorea "was the result of irritation produced in the nerve-centres by fine molecular particles of fibrin which are set free from an inflamed endocardium and washed by the blood-current into the capillaries of those centres."¹ In 1867, Tuckwell,² influenced by these views, put on record an important case of chorea, with mania followed by death, in a boy. This autopsy was one of the earliest of those which have been made with sufficient care to entitle them to consideration. He found numerous bright, warty vegetations along the free margins of the mitral valve. In the brain small areas of red softening were observed in the cortex of the frontal and also of the "posterior" lobe, and into one of these an arterial twig, firmly occluded with a small white fibrinous plug, was seen to run. In the spinal cord softening was found in the posterior columns of the lower cervical and all the dorsal region, and one of the blood-vessels of this part was affected as in the brain. Ogle³ published a paper giving details of 16 fatal cases of chorea, of which 10 cases presented more or less fibrinous deposits or granulations upon some portions of the heart's valves or lining membrane. Broadbent⁴ elaborated the embolic theory to some length: Choreia, he says, is a symptom and not a disease; *i. e.* it depends upon the *seat* of the morbid process rather than upon any *one* distinct morbid process. This seat is the sensori-motor apparatus, the thalamus and corpus striatum. The cerebral hemispheres are not primarily involved, as the mind is not affected except secondarily; neither can the symptoms be attributed to the cord, to which can only be assigned tonic spasms, uncontrolled by the will, increased during sleep, and especially not unilateral. He thinks the emboli are not confined to the thalamus and corpus striatum, but that it excites chorea in them, delirium in the brain-cortex, and tetanus in the cord; hence, chorea is an "insanity of the muscles" or a "delirium of the sensori-motor ganglia." He thinks that emboli are the frequent, but not the invariable, cause of chorea, which may be caused by shock also and by pregnancy, intestinal worms, etc. Hughlings Jackson has especially identified his name with the embolic theory. He speaks of puerperal mania as a "chorea of the mind," and thinks it may be due to the same pathology (embolus) as that which causes chorea, but in a different part of the brain. He meets the objection that plugging of a

¹ Tuckwell: "Maniacal Choreia," *B. and F. Med.-Chir. Rev.*, Oct., 1867. ² *Ibid.*

³ *B. and F. Med.-Chir. Rev.*, Jan., 1868.

⁴ *Brit. Med. Journ.*, April 17, 1869.

vessel could not cause increased action, as follows : Plugging does not always cause *anæmia*, but sometimes a congestion which may be due to increased pressure on the collateral vessels or by a return of blood from the veins. Hence the action of the parts is not necessarily *decreased*, but is defective.¹

I have referred in some detail to this embolic theory of chorea, because it has become historic as the only plausible theory which pathology has had to offer to explain this important disease ; because, also, of the eminent names which have been associated with it ; and finally, because, while much overrated in the past, it may contain some elements of truth as a contribution to the future. Like so many other theories springing up from a too exclusive pathological or post-mortem view of disease, it may in part substitute effects for causes, and find in a few mere necroscopic phenomena an erroneous interpretation of the essential nature of disease. That it does not and cannot explain many of the facts of chorea has been very generally maintained. This is not more conclusively shown anywhere than in these very cases of chorea occurring in pregnant women. Those who have observed such cases, and have studied the reports of cases by others, must be impressed with the fact that some special features exist in them which can only depend upon something special, but unknown, in their causation and their pathology. The large proportion of them occurring, for instance, in young primiparæ, and, again, in women illegitimately pregnant, suggests at once a moral influence ; which confirms the oft-observed fact that simple chorea is caused also by moral changes, as shocks, fright, etc. The extraordinary severity of the symptoms, unequalled by all other cases of the disease, suggests, at least, that if they have a common cause with simple idiopathic chorea, that cause is certainly strangely intensified by some special conditions which would be sought for in vain in the capillary system. The fatal termination of such a large proportion of these cases—out of proportion, I believe, to the deaths in simple chorea—is difficult to explain by the theory of emboli, although not necessarily antagonistic to that theory. The fact that pregnancy is so specially obnoxious to this disease seems to preclude the necessity of searching in some other condition, such as rheumatism, for a cause, especially as so many cases of chorea have occurred in pregnant women who have never had rheumatism and who present no cardiac lesions. To say that all cases which do not support a given theory have been improperly observed and reported is only to beg the question, and is certainly no more justifiable than, if indeed it is as reasonable as, the assertion of some that the occurrence of these very minute vegetations on the valves of the heart is an event which happens about the time of the death of the patient, as is evidenced by the fact that they can be dis-

¹ *Med. Times and Gaz.*, 1869, i. 245.

placed by the stroke of a soft camel's-hair brush. Certainly, it would not be proper to ignore the relation of rheumatism, and especially of endocardial changes, to chorea; but it would be unwise to ascribe too exclusively to such changes a disease which shows itself so frequently in other conditions, and in none more significantly than in pregnancy. As for the many other post-mortem appearances reported, such as hyperæmia and microscopic changes of degeneration of the multipolar and other cells, it can only be said that such have been reported for almost every nervous disease known, and that they are probably either effects or coincidents of the disease in question, and not characteristic of its cause.

Rheumatism as a cause of chorea has probably been overestimated. In the report of the collective investigation committee of the British Medical Association of 439 cases, only 26 per cent., or about one-fourth, had had rheumatism with distinct joint affection and fever. When we consider how common rheumatism is, especially in England, the question may well arise whether in these cases this disease was a necessary antecedent to the chorea. Many of these rheumatic cases occupied debatable ground. It is also of especial interest to know that a certain small number of cases were reported in which rheumatism appeared *first* during the choreic attack in patients who had never before had rheumatic symptoms. Considerable interest attaches, according to this report, to the influence of the exanthemata in the causation of endocarditis, which in turn might cause a murmur before and independent of the chorea, or predispose the heart to the production of a murmur under the choreic influence: 7 cases of these 439 were instances of the chorea of pregnancy, and are related in detail; 5 recovered, 1 died, and 1 was lost sight of. Several aborted or went into premature labor. The movements in some were very violent.

The blood of the choreic patient is often reduced in its normal constituents, but this anæmia does not differ from that found under other circumstances. In a case reported by Dr. Hirst, to be again referred to, the number of red blood-corpuscles was very much decreased.

PROGNOSIS.—The number of fatal cases of the chorea of pregnancy relative to the total number of cases of the disease occurring in this state is certainly very much greater than the relative number of fatal cases in simple uncomplicated chorea. Barnes¹ collected in 1889 all the cases of pregnancy complicated with chorea which he had been able to find. The total number was 56, of which 17 were fatal—about 30 per cent. These are certainly very alarming statistics. They, however, represent probably only the worst cases, or at least a large percentage of them are the worst cases, because the probability is great that fatal cases of the chorea of pregnancy are much more apt to be

¹ *Trans. Obstet. Soc., Lond.*, vol. x.

put on record than the cases which recover. I have known of at least 4 cases of pregnancy complicated with chorea which have never been recorded; 3 of these I have seen, and they are referred to now in this paper for illustration. The patients all recovered. If any one of these cases had proved fatal, it would probably have been published. Again, the fatal cases are not always reported as fully as could be desired, as given in Barnes' paper, and the question arises whether they were all cases of pure chorea, and whether any complications existed, as sepsis, hemorrhage, etc., which may have influenced a fatal result. Still, discounting all such possibilities, it seems positive that chorea in the pregnant woman is a grave disease and that it threatens possibly three serious results. In the first place, it may jeopardize the life of the mother, as has been seen. This appears to be especially so under some circumstances. Thus, the primiparous woman and the woman illegitimately pregnant appear to have contributed a large share of fatal cases. Leviek¹ reported the case of a girl aged seventeen who had been seduced. She was bitterly reproached by her mother when her pregnancy was discovered, and immediately became violently agitated and convulsed in chorea. The case terminated rapidly in death. The possible influence of abortion and premature labor in contributing to a fatal result is an important question; certainly very many of the fatal cases have aborted. On the other hand, the question of producing abortion or premature labor as a curative measure will inevitably arise in grave cases, but the experience of others teaches that these procedures do not always bring relief. In this connection is indicated the second serious result which is always threatened by an attack of chorea during pregnancy; *i. e.*—the death of the child. Of Barnes' 17 fatal cases, the following figures are very significant: the number of cases is really 20, 3 of them non-fatal, because one patient had chorea in four succeeding pregnancies, and died in the last one; abortion, 4; undelivered, 4; stillborn, 4; born-alive, 3; not stated, 5. The non-fatal cases give the following results: abortion, 5; born-alive, 24; premature labor, 5; stillborn, 1; not stated, 5. Some of these cases had chorea in successive pregnancies, making a total of 40; 1 case developed chorea after labor. Of the cases non-stated and in the premature labors the results to the child cannot be given. It thus appears that of a total of 61 cases the result was disastrous to the child in 18 cases at least, giving about 28 per cent.

Finally, the relation of chorea to long-continued mental disorder is an important question when the prognosis of the disease is considered. Very few writers seem to have taken this into account, except Marcé, who says² that in non-fatal cases the grave maniacal state may sometimes leave after it divers affections of the intellect of variable dura-

¹ *Am. Journ. Med. Sci.*, 1862.

² *Op. cit.*

tion. These serious results, while not to be ignored, are probably of very rare occurrence, or we would hear more about them in the numerous cases of chorea in pregnancy which are now on record. In the only case of long-continued mental disease associated with or following the chorea of pregnancy, which I have seen and which I have already narrated, the symptoms of insanity were not manifested until after the patient had had chorea for nearly five years, during which time she had borne two children. The kind of mental disorder then shown was melancholia, with partially systematized delusions of persecution and with marked mental weakness.

Dr. Hirst's case, to which I have already referred in the paper on "Puerperal Insanity," was a most instructive one. This patient was a young primipara, illegitimately pregnant, who developed hemichorea in the sixth month. She was apparently cured of that, but rapidly ran down into anæmia, in which the blood-corpuscles were reduced in number at least 25 per cent. She became very weak mentally, "her reason quite gone." The condition was so grave that premature labor was induced in the eighth month, with the result of saving the child; but the mother did not improve in her mental disorder, the blood-corpuscles were still further diminished, and at the last report it looked as though the insanity would be permanent. In this case it is probable that the chorea and mental deterioration were effects of a common cause, rather than the latter the effect of the former.

TREATMENT.—No specific exists for chorea, and especially for the chorea which complicates pregnancy. Several drugs can often be relied upon to give good results in the simple, so-called idiopathic, chorea of childhood and youth, but I would not have much confidence in them in a case of severe chorea happening in a pregnant woman, although they might be tried. The two drugs which do the most good are arsenic and iron. The anæmic state often present indicates their use, but even in cases where anæmia is not marked they appear to be required. In the nervous clinic of the University of Pennsylvania, where I formerly saw many cases, the best results were obtained by a gradually increasing dose of Fowler's solution; thus, treatment was commenced with three drops *t. i. d.*, and increased one drop daily until a physiological effect was produced or until twelve drops *t. d.* were given; then decreased, or even suspended for a few days. According to the collective investigation of the British Medical Association it seems that arsenic and iron were both used, partly because they are the fashion: both of them failed in some cases. The treatment without drugs and with full diet alone, according to that report, gave an average duration of ten weeks, which was about the average of treatment with drugs. Arsenic is reported to have done good in only about 3 per cent. of the cases.

But pregnancy seems to offer an obstacle to the treatment of chorea which is wellnigh insurmountable, although occasional cases are reported which have recovered and gone on to full term. In the very severe case which I once treated, referred to above, no sedative medicines did any perceptible good. Hyoseyamus, conium, and the bromides were used in vain. The girl was blanched, and was suspected for some reasons to have had syphilis. She was put on the "four chlorides," and improved both in her blood-state and in her chorea. This prescription calls for the corrosive chloride of mercury, the solution of the chloride of arsenic, the tincture of the chloride of iron, and hydrochloric acid in doses to meet the requirements of the individual case. The patient was lost sight of before her confinement.

Dr. Frühwald¹ recently reported rapid improvement from arsenic by hypodermatic injection, cure resulting in from three to four weeks. Fowler's solution, perfectly fresh, is mixed with an equal part of distilled water, filtered, and injected deep into the tissues, the skin being first washed with thymol. Increasing doses are used. I resorted to this treatment in the following case in the Philadelphia Hospital: E. H—, aged 19, married, had had an attack of chorea, confined to the right side, when fourteen years old. When seven months advanced in her first pregnancy she quarrelled with her husband, and was bitten by him on the breast. One or two days after this she began to have choreic movements. These increased in severity as pregnancy advanced. She was delivered at term. The child was alive, but died of convulsions when a few months old. The chorea did not stop at the confinement, but continued until the patient's admission to the hospital several months later. She was very anæmic, and at times lachrymose, with constant choreic movements of the face, neck, arm and leg-muscles, more marked on the right side, and intensified by an abrupt question or by excitement of any kind. The twitching of the corners of the mouth and of the palpebral muscles was especially noticeable. Her treatment consisted of rest in bed at first, the administration of Bland's pills, and arsenic, given hypodermatically, as recommended by Frühwald. Fowler's solution was used, with initial doses of three minims night and morning, increasing by two minims every second day, until sixteen minims night and morning had been reached. This dose was continued, the injections being made into the calves of the legs, until two large abscesses formed. This result was evidently due to some relaxation in our antiseptic precautions, although great care in this respect had been enjoined and practised. After these accidents the arsenic was given by the mouth until thirty-two minims t. i. d. were given, the effect being carefully watched. Under the hypodermatic treatment the patient's anæmia improved and the choreic movements

¹ *Deut. Med. Zeit.*, Jan. 3, 1887.

decreased. The improvement continued during the administration by the mouth. Unfortunately, the case went from observation before restoration to health was complete. I am unable to say that this one case proved the superior efficacy of arsenic given in this way, but the impression made at the time was that improvement was more rapid than we had a right to expect.

Cimicifuga has been much praised in chorea, especially by Dr. Hiram Corson. I have been disappointed by it. In the case seen in the Pennsylvania Hospital for the Insane narrated on a preceding page it had been given *ad nauseam* without perceptible benefit.

The salicylates may be tried if the case is attended or immediately preceded by marked rheumatic symptoms. Among the numerous remedies commended are sulphate and oxide of zinc, belladonna, gymnastics, galvanism, and change of air. None of them will be apt to prove beneficial, and some of them are impracticable in the chorea of pregnancy.

The following remedies may possibly be beneficial sometimes: Morphia may promote sleep when that is much interfered with, and then chloral may be a useful adjunct to it. But morphia is an evil thing to be relied on in long-continued and obstinate diseases. Inhalations of chloroform have been used with some success in some of these grave-cases complicated with pregnancy. Chloroform acted better than ether in Dr. Goodell's case. Morphia under the skin and chloroform inhalations given by a careful and responsible hand appear to me to be probably the most reliable agents to control these wellnigh uncontrollable paroxysms. The spinal ice-bag is sedative, but difficult to keep applied.

The last consideration is artificial abortion and premature labor. It is incontestable that many cases of chorea in pregnancy recover at or soon after the confinement, but it is also a fact that some cases do not. The cases, however, which do not immediately recover are not made worse, but are no doubt put in a better position to make a recovery than they were in while big with child. It is of course a very grave matter to take the life of the unborn child, or even to endanger it as in a premature labor. The only rule that can apply is the very ancient one, that only the certain death of the mother justifies such a step. The statistics of Dr. Barnes show without doubt that women not unfrequently perish in this disease, and that the child almost always perishes with them. The obstetrician in some cases has to consider the question only of premature labor when the child is viable and the risk, therefore, is more justifiable. In Dr. Hirst's case the mother did not improve after premature labor, but the child's life was saved. This suggests the important question whether in severe cases happening in the eighth and ninth months the chances of saving the child are not *promoted* by

a premature labor—whether it is not better so to remove it rather than allow it to continue exposed, as it must be, to grave risks in its mother's abdomen. It does not seem possible to formulate a positive rule to cover all cases: statistics must yet accumulate, and much, after all, must be left to the judgment and sense of the individual observer as applied to the requirements of the individual case. In cases of a mild type these serious questions will of course not arise at all, while in severe cases the indications of threatened danger to the mother or child, or both, will probably not be difficult to recognize.

TETANUS FOLLOWING ABORTION AND LABOR.

HISTORY.—The rarity of tetanus as a complication of abortion or the puerperium is evidenced by the general impression that it is even unheard of, and by the fact that very many of the standard works on obstetrics do not so much as mention the disease. One of the latest writers on tetanus, Nieaise,¹ says the puerperal state appears to be without influence in causing this affection. The leading authors, such as Dewees, Cazeaux, Ramsbotham, Leishman, Lusk, Playfair, and Fordyce Barker, ignore the subject—the later writers in spite of the fact that James Y. Simpson² published a paper on it as far back as 1854, and tabulated 27 cases which he had culled from various sources. Parvin is a notable exception, and devotes some space to tetanus in his recent valuable work. Curling³ in his monograph on tetanus does not mention the puerperium among the causes, nor give an instance in his table of 128 cases. Laurie⁴ in his statistics of tetanus gives 2 obstetrical cases in 221 cases due to all causes. It thus appears that very many have not even heard of tetanus in the puerperal state, and that very few indeed have had the opportunity or misfortune to witness it. It cannot, therefore, be the privilege of any one person to write upon the subject from wide personal observation. In the whole of medical literature probably not one hundred cases are reported with sufficient detail to be of use. Thus, any paper devoted to the consideration of tetanus in obstetrical practice must be something of a cento of the observations and records of a very few and widely scattered writers. The subject has two aspects of interest: one is strictly literary and historic, as has been indicated above: such a study will briefly occupy our attention first in this paper. The second matter of especial interest concerns tetanus in all conditions, and is not peculiar to it in the puerperal state: this is its probably infectious nature and bacteriolog-

¹ *Int. Encycl. Surg.*, art. "Inj. and Dis. of Nerves."

² "Cases of Tetanus," etc. etc., *Monthly J. of Med. Sci.*, Feb., 1854.

³ *Treatise on Tetanus*, London, 1836.

⁴ *Glasg. Med. J.*, vol. i.

ical origin; and this, as will readily be seen, is a subject of great practical importance to the obstetrician as well as to the surgeon.

Statistics will not be presented in this paper, because, in the first place, very little value is to be attached to them when founded upon such a limited number of cases as are attainable, which cases, moreover, are reported with various degrees of accuracy; and because, in the second place, many of the reported cases have already been subjected to the statistical method by Dr. Garrigues, who has extracted a relative value from them.

Tetanus in the childbearing woman was not unknown to the ancients. A few authors refer to it, and these have been quoted by every modern writer who wishes to give an appearance of erudition to his work. Thus, Aretæus¹ alludes to abortion as a cause. Archegines is quoted by Hervieux² as ascribing tetanus to abortion. These are about the only references to the subject in the ancients, except a sentence alluding briefly to tetanic symptoms to be found in the collection of Spachius under the head of *Martinus Akakia*, and which some have ascribed to an ancient author. Ætius, who wrote more fully on obstetrics than any other ancient, is said to allude to the so-called puerperal tetanus, but I have not been able to verify the quotation. These brief excerpts simply gratify literary curiosity, and are too meagre to convey much real information. Among the moderns Currie appears to have been the earliest to allude to this subject. In a paper³ extolling the cold bath as a cure for tetanus he mentions a case in a woman as a result of a difficult labor in whom the "spasmus cynicus" and other symptoms of tetanus were present. Copland in his *Dictionary* merely says that parturition and abortion favor the occurrence of tetanus. Fournier-Pescay⁴ in 1820 says he had seen the disease show itself in a puerperal woman who went to a "latrine" exposed to the winds, and suffered a suppression of the lochia. Velpeau in 1832⁵ related the case of a young woman who developed trismus, and then tetanus, after abortion, and died in complete opisthotonus. Finncane de Nenagh⁶ in 1838 reported a case following version, and remarkable for the fact that death came in fifteen hours. Symonds⁷ refers to a case of his own. Storer⁸ in 1842 related an extraordinary case in which an adherent placenta was allowed to remain and putrefy in the womb, and in which the patient developed tetanus and died. Berg⁹ in 1847 printed an account of fatal tetanus in a lying-in woman, but the paper is not

¹ *Caus. et Sig. Acut. Morborum*, lib. prim. cap. vi. p. 5.

² *Maladies puerpérales, etc.*, Paris, 1870.

³ *Mens. Med. Soc. Lond.*, vol. iii. p. 147 (about 1790).

⁴ *Dict. des Sci. méd.*, art. "Tétanos."

⁵ *Des Convulsions chez les Femmes, etc.*, Paris.

⁶ *Lancet*, June 2, 1838.

⁷ *Cyc. Pract. Med.*, art. "Tetanus."

⁸ *Am. J. Med. Sci.*, Jan., 1842.

⁹ *Med. Correspdz. Bl. d. Wurtemberg, Aerztl. Vereins*, Stuttgart, 1847, xvii. 344.

accessible to me. But the first paper of note upon the subject was Simpson's, which appeared in 1854, and which, because both of the importance of the subject and the eminence of the author, ought to have secured for the disease a place in every classical work on obstetrics. He collected 27 cases, several of them doubtful, and expressed some novel and advanced ideas for his day.

After Simpson's paper more reports of cases began to appear in the journals, but nothing like a careful treatment of the subject was again attempted until Hervieux in 1870 wrote a valuable chapter on puerperal tetanus in his work already quoted. Then Lardier wrote in 1874 his thesis¹ on the same subject—a work highly praised, but which I have not obtained. Collongues in 1878 and Benington in 1885 have contributed to the subject. In 1882, Henry J. Garrigues published the most elaborate statistical paper² on obstetrical tetanus which has yet appeared: in this paper he tabulated 25 cases after abortion and 32 cases after parturition, 57 cases in all. These were all the authentic cases he could find after much time and labor. They included all Simpson's genuine cases, as well as cases collected by Hervieux, Lardier, and Churchill, and additional cases collected by Dr. Garrigues himself.

The *Index Catalogue*, that "refuge of the uninformed," is not yet completed as far as the subject of "Tetanus," but I have obtained, by request, from Dr. Billings all his references to "Puerperal tetanus." These permit me to add some interesting cases which have apparently escaped the keen search of others. In 1848, Leiby³ of South Carolina reported a fatal case in a young multipara after a perfectly normal labor, coming on after a slight exposure to a fog on the tenth day. This patient was bled heroically and otherwise reduced, and drenched with buckets of cold water, so that she lived only about one day after the initial symptoms. Blackshaw⁴ relates a fatal case, after abortion and plugging the vagina, in a woman aged forty-eight years. Day,⁵ Gibbon,⁶ and Gibbons,⁷ each reports a fatal case. All these patients had suffered from hemorrhage, hour-glass contractions, or adherent placenta and introduction of the hand, the tetanic symptoms appearing at the sixth to the tenth day. Blachez⁸ relates a fatal case on about the fourteenth day. Atlee⁹ reported a fatal case following abortion, which was especially interesting from the fact that the patient had received a

¹ *Du Tetanos puerpéral, etc.*, Paris, 1874.

² "Obstetrical Tetanus and Tetanoid Contractions," *Am. J. Obst.*, Oct., 1882.

³ *Charleston Med. Journ.*, vol. iii., 1848, p. 283.

⁴ *Brit. Med. Journ.*, vol. ii., 1865, p. 252.

⁵ *Southern Pract.*, 1880, vol. ii. p. 307.

⁶ *Trs. N. J. Med. Soc.*, 1878-79, p. 355.

⁷ *San Francisco Med. Press*, April, 1864.

⁸ *Gaz. heb. de Méd. et de Chir.*, 19 Juin, 1874.

⁹ Quoted by McGugin, *Trans. Am. Med. Assn.*, 1864, vol. xv. p. 291.

bite or "scratch" from a dog some weeks before, and expressed great dread of hydrophobia. Smith¹ gives details of a fatal case of tetanoid convulsions coming on *before* labor was ended. It was probably not true tetanus, but, as consciousness was preserved, it does not look like eclampsia: the urine was not tested. Other cases are reported by individual observers.

Some physicians have had the unusual experience of seeing more than one case of tetanus in obstetrical practice. Aubinais of Nantes reported three cases many years ago. Wm. A. Gordon² had three cases in his own practice in five years.

Puerperal tetanus is evidently a much more common disorder in hot countries than in the United States and Europe; and the reason we have not heard more of it is that scientific observation does not prevail extensively in many of those lands. In tropical countries, such as India, however, where skilled physicians and medical journals abound, the records of this malady are not so meagre. More than thirty years ago Waring³ in his *Notes* on some of the diseases of India spoke of the extraordinary frequency of puerperal tetanus at Bombay. In three years not less than 232 women were recorded as having perished from this disease. Native physicians have since reported cases. Bindabun Chatterjee⁴ had a case of tetanus after delivery in a Mohammedan woman. Doss⁵ reported a case of trismus with septic infection following a neglected abortion, the patient recovering. Mootoosamy⁶ had a fatal case in a Hindoo after craniotomy. Mullick⁷ had a case with recovery under chloral and the bromides. He says the disease in India is usually fatal, but that the later the attack the more favorable the prognosis: thus, patients seized within a week after labor nearly always die, but not so in later cases. Roy⁸ reported two fatal cases, one of them after miscarriage in a girl twelve years old—the youngest case probably on record; the other after labor in a patient aged sixteen.

Some of the major obstetrical operations have been followed by lock-jaw. Paul Dubois in 1839 performed the Cæsarean section, and the woman died of tetanus on the seventeenth day after the operation. Dr. Robert P. Harris of Philadelphia informs me that of 121 deaths after the Cæsarian section in the United States no case was due to tetanus. It is a curious fact, however, that one child died of it thirty-six hours after its mother was operated on by Prof. Lusk, Nov. 21, 1887, at Bellevue Hospital, N. Y. Dr. Harris says that three deaths by tetanus have occurred after the Porro operation down to 1885, as follows:

¹ *Med. and Surg. Reporter*, Sept. 20, 1873.

² *Am. Journ. M. S.*, 1866, p. 102.

³ See notice in *B. and F. Med.-Chir. Rev.*, Oct., 1856, p. 558.

⁴ *Ind. An. Med. Sci.*, 1854, ii. 471.

⁵ *Ind. Med. Gaz.*, Dec. 1, 1873, p. 321.

⁶ *Ibid.*, Nov. 1, 1877.

⁷ *Ibid.*, Mar. 1, 1877.

⁸ *Ibid.*, July 1, 1874.

Peyretti of Turin, death of mother on the tenth day, child living; Ficki of Warsaw, death on eighth day, child living; Parona of Novara, death on the eighth day, child living.

Tetanus after parturition has been observed in the lower animals. Denham¹ says that he once saw a fatal case in a cow after adherent placenta. Sir Thomas Watson² tells us that he saw a mare die of tetanus a few days after foaling. Mr. Jonathan Hutchinson³ read a paper a few years ago to the London Obstetrical Society on certain causes of death in ewes during and after parturition, in which he gave details of an epidemic of tetanus among his own flock. About 30 suffered, and 8 or 9 died. No sheep were attacked except the ewes which had lambed. The literature of veterinary medicine would probably give other instances if searched.

It is not necessary to multiply examples which repeat simply the facts already referred to. I have not been able to verify and utilize, for want of time and space, all of the sixty-seven references which Dr. Billings has sent to me. These references are most of them additional to those contained in the now historic papers of Simpson, Lardier, and Garrigues; and may be appropriated, if desired, by some future statistician.

Puerperal tetanus has on one occasion, at least, been a subject of great medico-legal interest. Dr. J. Morris⁴ tells us that a "Voodon" woman was recently tried in Baltimore for murder committed by criminal abortion. The patient had died of tetanus following this manipulation. A physician testified that the abortion could not have caused the patient's death, even indirectly, because tetanus never followed abortion. On this evidence the trial was discontinued, and a new trial commenced—not for murder, but for the criminal abortion. Other physicians testified that the woman died of eclampsia. This case illustrates very plainly that lockjaw following miscarriage and labor is unheard of by many physicians, although at the time of this trial nearly everything was on record which is now collected in this paper. It also appears in this case how the question of a diagnosis of tetanus from eclampsia may be raised. The woman's symptoms are not given in the paper.

The occurrence of traumatic tetanus in pregnant women has been mentioned by some writers. Wiltshire quotes a case from Dupuytren of a pregnant woman who had traumatic tetanus and did not abort. Allis⁵ mentions a case of a woman dying of lockjaw at full term: the foetal heart continued to beat for five minutes, but abdominal section

¹ *Dublin Quarterly*, 1865.

² *Practice of Physic*, Philada., 1872, 522.

³ *Obstel. Trans. London*, vol. xviii.

⁴ *Maryland Med. Journ.*, Baltimore, 1885-86, xiv. 137-139.

⁵ *Phila. Med. Times*, 1875, 508.

post-mortem was not made. Some of the fatal cases of so-called "intermittent tetanus" in pregnant women may have been true tetanus of an unusually intermitting type. Such cases are reported by Mikschick¹ and T. C. Smith. Collins had a fatal case of tetanus complicating labor.²

CAUSES.—Exposure to cold and damp and sudden changes of temperature have been regarded for many years as especial exciting causes of lockjaw. In the tropics, where the contrast between the heat of the day and the coolness of the nights appears to be greater than in the more temperate countries, these causes have been especially regarded. Larrey³ speaks of the nights being uncomfortably cool in Egypt, although the days were hot, and attributes tetanus to the coolness and humidity of the nights. This cause has been assigned for a number of the puerperal cases. One of these was said to be due to the patient lying all night in the draught from an open window: her disease was at first supposed to be a sore throat and stiff neck due to this cause. It is noticeable that a great many of the reported attacks of tetanus following abortion and labor have occurred in cases in which some difficulty, accident, or operation had preceded. Abortion, adherent placenta, flooding, dystocia of one kind or another, have been the precursors of many of these cases. Several authors have regarded the tampon as the immediate cause. Eclampsia is reported in one, but this fact suggests the possibility of the case being "tetanoid" due to uræmic poisoning, as in some other cases reported. The fact, on the other hand, that many cases are reported after normal labors does not disprove the traumatic nature of the disease, as even the simplest and easiest labors are not exempt from tears and wounds of the soft parts. The statement of Verneuil, that all tetanus is traumatic, that spontaneous or idiopathic tetanus does not exist, appears to me to be the most consistent with our knowledge of the subject. If it can be proved that the essential cause of the disease is always a microbe, then the importance of numerous and unrecognizable—so-called exciting—causes diminishes very much.

Moral causes have been claimed for tetanus by some writers. Wiltshire⁴ reports two cases in which a decided mental excitement appears to have been a forerunner of the disease: in one of these a lady became pregnant illegitimately during the absence of her husband abroad, but a more rational explanation of her case is found in the probable fact that a criminal abortion had been performed.

SYMPTOMS.—The initial symptoms of tetanus are almost always in the muscles of the jaws and neck. This is shown in nearly all the cases reported after abortion and labor, and is the same in surgical and so-called idiopathic lockjaw. In fact, the onset of the symptoms and

¹ See Garrigues' paper.

³ *Op. cit.*

² *Med. and Surg. Rep.*, 1877, vol. xxxvi. 129.

⁴ *Obstet. Trans. London*, xiii. 133.

the character of them are the same from whatever cause this terrible disease may arise; hence, any person who has seen a case after a surgical lesion ought to be able to recognize one when it occurs during the puerperium. This onset of tetanus was well marked in a fatal case following Allingham's operation for hemorrhoids, performed by Dr. John B. Deaver, which unfortunately occurred in the writer's practice a few months since. This patient, a man who had been doing perfectly well, was seized suddenly in the afternoon of the sixth day with a temporary stiffness of the jaws and a "queer feeling" in the back of his neck—exactly as is described by some authors who report cases of the puerperal class. When first seen within an hour no stiffness was observable, but the patient was sitting up in bed very pale and agitated. I think he suspected lockjaw, but he said nothing about it. Within a few hours trismus and retraction of the head were well marked, and the terrible suspicion was confirmed which the first ominous symptom had excited. I was convinced from close observation of this case that these initial symptoms are partly *subjective*, and hence liable to grave mistake. When I first saw the patient he opened and shut his mouth and moved his head backward and forward with perfect freedom, but he held his hand on the nuchal region and insisted that something was wrong *there*. Although suspicious and fearful of the true nature of the malady, I was also inclined to dismiss the idea and regard the case as one of "nervousness." A number of the puerperal cases, as will be seen, have thus been dismissed at first as "hysterical."

As the case advances the muscular stiffness becomes more general. The muscles of the back become involved, and, along with those of the jaws and neck, are usually the most affected. The spasms are tonic in character, but are liable to spells of increased severity, during which the cramp-like spasm becomes intensely painful to the patient and terrible in the extreme to witness. In these exacerbations the head is violently drawn backward, the jaws fixed, the back arched, the lower limbs usually are rigid and extended, and the patient assumes the position of opisthotonus. The face is flushed and somewhat dusky at these times, the eyes rather protruding, and the facial expression distorted in the horrible sardonic grin. Sweat streams off of the body from every pore. The unhappy patient in my case, as in some others reported, constantly kept the handle of a spoon or some other hard substance inserted between his teeth. The consciousness is unaffected: this adds much to the horrors of the case.

These exacerbations are easily excited by peripheral irritation. The slightest shock, or even noise, is sufficient, as the shutting of a door or a draught of air. Attempts to feed the patient are especially provocative of these spells. In many cases swallowing is quite impossible.

Nutritious or medicinal enemata excite these attacks, and are sometimes immediately expelled with violence.

The muscles of the abdomen are usually tense and board-like, and occasionally, it is said, the muscles of the anterior parts of the trunk are most convulsed and draw the body into a position of anterior curve or *emprosthotonus*.

The pulse soon becomes weak, and in bad cases exhaustion from starvation and the violence of the disorder soon appears. Some cases have proved fatal in a very few hours; most fatal cases linger from one to three days; occasionally a fatal case is prolonged more than this.

The temperature in tetanus is usually increased, and some cases are reported in which it ranged very high. Some observers report a continued rise for a period after death.

The respiration, especially during the exacerbations, is embarrassed; mucus collects in the bronchial tubes and cannot be expectorated; the face becomes congested and cyanosed.

Death usually occurs from exhaustion and the interference with respiration.

PATHOLOGY.—The chief interest which attaches to the subject of tetanus at present concerns its etiology and pathology. In a brief review¹ of the subject which I made about one year since some of the following facts were stated: The infectious nature of the disease had attracted attention long before the present epoch of microbial pathology had subjected it to the test of experiment and scientific induction. According to Andry,² Ambrose Paré believed that foul dressings were one of the causes of it. Bajou observed that *trismus nascentium* diminished when the umbilical wound was kept clean. During the Seven Years' War there were, it is said, terrible epidemics of tetanus. Larrey observed something on a smaller scale in Egypt. He tells us³ that he had quite a breaking out of it after the battle of the Pyramids and the battle of Aboukir. In Denmark antiseptics has freed one maternity from *trismus* which had ravaged it. Colles stated long ago⁴ that attention to the umbilicus secures almost certain immunity from *tetanus neonatorum*. Cagnat, having castrated six horses with the same *écraseur*, saw them all die of tetanus; the *écraseur* being then disinfected the mortality ceased. Huvelier lost by tetanus fifteen horses in as many operations performed at one time. Anger has seen a dog develop tetanus from a horse. Vernenil advocates the theory of the equine origin of human tetanus. Experiment seems to confirm these clinical observations. Carl and Rattone have inoculated tetanus from a patient with a pustulous sore on his neck. With injections of their

¹ *Annual of the Universal Med. Sciences*, art. "Tetanus."

² *Lyon. Méd.*, Aug. 14, 1887.

³ *Mém. de Chir. militaire*, etc.

⁴ *Dub. Hosp. Rep.*, vol. i.

dilution they had trismus and opisthotonos in eleven rabbits out of twelve. Rosenbach claims to have discovered the specific microbe of tetanus, but his claim has not been generally allowed. Bonome has also claimed to have discovered a bacillus "very minute and transparent." Verneuil¹ has declared that he is convinced of the non-existence of spontaneous tetanus. A microscopic trauma is easily followed by a true traumatic tetanus. He believes that tetanus is related to virulent or infectious microbial diseases, and always has a specific cause, a virus coming from without.

Shakespeare has inoculated rabbits with material from the medulla and cord of a horse which had died of tetanus. His researches tend to show, with those of other experiments, that traumatic tetanus in the horse and mule is sometimes at least an infectious disease, transmissible to other animals. Peiper² reports the following interesting facts. An infant developed tetanic symptoms five days after birth and one and a half days after the falling of the cord. The navel wound was suppurating. Five mice were inoculated from this matter. Tetanus appeared in three mice and death quickly followed. Guinea-pigs were inoculated from the dead mice, and died in five days.

The epidemic of tetanus among his parturient ewes, which has been reported by Mr. Hutchinson,³ has been already noticed. Puerperal tetanus in sheep is said to be rare, yet in this instance it invaded a flock, attacking thirty and killing eight or nine. This certainly looks like infection. No sheep in the flock were attacked except the ewes after parturition. Mr. Hutchinson attributed the malady to a certain kind of food, but this does not appear plausible.

It is a curious fact that Simpson in his paper⁴ on puerperal tetanus in 1854 distinctly stated the possibility of a "special blood-poison" at the site of the wound or elsewhere, and suggested the propriety of trying to inoculate one animal from the blood of another dying of tetanus. This was certainly an anticipation of the now prevalent opinion and work on the subject. In one of the cases in his list the mother was attacked three days after labor and died; the child also soon died with trismus. Mootoosamy⁵ says that puerperal tetanus in India is due to the uncommonly bad hygiene of the huts. It is not so common in the lying-in hospitals as among the natives in their own homes.

As an illustration of the possible infectiousness of tetanus I may refer to a case of my own which occurred recently, and which is given in more detail elsewhere. The case was not puerperal, but followed upon an operation for hemorrhoids. The patient died at the end of the second day of his tetanus and one week after the operation. There was no known source of infection from any preceding case. A segment of the

¹ *Le Progrès méd.*, 1887.

⁴ *Op. cit.*

² *Cent. f. klin. Med.*, 1887.

⁵ *Op. cit.*

³ *Op. cit.*

upper cervical cord was taken out and given to Dr. E. O. Shakespeare of the Philadelphia Hospital. From this section of the cord Dr. Shakespeare made inoculations beneath the dura mater of the brain in several rabbits. One of these rabbits died tetanic, but after several weeks. Another littered, and the young of this litter exhibited unusual motor excitability, and several of them died in tetanoid spasms.

The production of a ptomaine due to bacteria has been regarded by some as the exciting cause of tetanus in these cases of probable infection. The telluric origin of the microbe is possible.

The intention in this brief reference has not been to advocate any special pathological theory, but merely to state the case. The subject must evidently be made the field of wider and more critical research. It appears conclusive, however, that tetanus does sometimes present an infectious and epidemic character, and must in this aspect be of special interest and importance to the obstetrician. The so-called puerperal tetanus has thus prevailed in India and in the lower animals in our own climate; while trismus in newborn infants, which has been sometimes such a scourge, appears to be quite amenable to antiseptic treatment.

No other attempted explanation of tetanus need be stated here. It has thus far been a disease without a satisfactory pathology, and uniform anatomical lesions after death have not been reported. Lockhart Clark has made some careful microscopic studies of the histological changes in cases of tetanus, but they appear to be as much the effects as the causes of the disease. In septic cases the possibility of the symptoms being due to meningitis ought not to be forgotten.

DIAGNOSIS.—Tetanus may be confounded with strychnia-poisoning, inflammation of the cerebro-spinal meninges, and hysteria. This latter disease is especially apt to be erroneously ascribed to the puerperal woman who becomes the victim of lockjaw. The early symptoms, which are always referred to the throat and neck, have been mistaken a number of times for inflammation of the throat and stiffness of the neck-muscles due to exposure to cold. It must be borne in mind also that some cases have been reported as "tetanoid" which are probably due to uræmic poisoning and have no relation whatever to true tetanus. Simpson¹ says: "Tetanus, when it has taken place in obstetric practice, has apparently been repeatedly mistaken, in its earliest stages, for an attack of cynanche, or even oftener, perhaps, for some irregular form of hysteria." The first symptoms may thus be overlooked as unimportant, as in Velpeau's case. In this instance a young woman was admitted to the hospital after a miscarriage, and was thought to be shamming nervous symptoms: a change of service occurring, she was somehow ignored or overlooked until found dying in opisthotonos. Day's fatal case of tetanus came on ten days after labor and after great emotional

¹ *Op. cit.*

disturbance, which seemed to be the immediate exciting cause, and which might easily have been regarded as hysterical. On the other hand, hysteria may be mistaken for tetanus. Several such cases are reported. Morris¹ published details of a case of intermittent so-called "tetanus" during pregnancy, marked by rigidity, loss of consciousness, sobbing, etc., which was probably hysterical. F. H. Gordon² reported a case which he called "tetanus from sudden arrest of the catamenia." It was a typical case of hysteria in a girl sixteen years old, and was in no wise connected with either tetanus or pregnancy. Fournier-Pescay³ says that he has observed a case of tetanus during a hard, ineffectual labor. The labor was terminated by art, and the tetanus immediately ceased. Such a case could have been one of some temporary emotional disturbance only.

The history of the case, the emotional element, the loss or assumed loss of consciousness, the changeableness of symptoms, the absence of trismus between the exacerbations, are a few of the important features which distinguish hysteria from tetanus.

Tetanus is very similar to the effects of poisoning by strychnia. I have not seen a case of strychnia-poisoning in the human being, but I have observed it in the dog, in which animal the most characteristic symptoms are tonic shocks very rapidly repeated, almost as in clonic spasms, but with persistent stiffening, at the same time, of the body and limbs in opisthotonos. These attacks remit as in tetanus, perhaps more completely. The duration of the symptoms is a guide of some importance: fatal cases of strychnia-poisoning, as a general rule, do not last as long as tetanus, although in this connection it ought to be remembered that in a case of puerperal tetanus following version, reported by Finucane, death resulted in fifteen hours.

The possible relation of *nræmia* to some states of muscular rigidity, and hence the possibility of mistaking *nræmic* symptoms for tetanus, are interesting topics in this connection. It does not seem, at first sight, as though there could be much possibility of confusion here. Some of the reported cases, however, suggest this possibility. Tonic, persistent spasm is sometimes seen in *uræmia*. I have seen great rigidity of an arm and other muscles, and even spastic hemiplegia, persist in *uræmic* coma during the intervals between the fits, although I have never seen anything nearer than this to a suggestion of tetanus. Dr. Garrigues' valuable paper was suggested to him by a case which he describes as "tetanoid contraction symptomatic of *nræmia*, etc.," but which was certainly not related to tetanus in any sense. It occurred in a colored woman pregnant with her second child: she had subnormal temperature and was stuporons. She had rigidity of the masseters and

¹ *Lancet*, Sept. 27, 1862.

² *Western Med. and Surg. Journ.*, N. S. 5, 1846, 391.

³ *Op. cit.*

muscles of the neck and limbs. The autopsy revealed chronic nephritis. Dr. F. Curtis Smith¹ also reports a fatal case of "tetanoid" convulsions coming on before labor was ended, but without loss of consciousness. The urine, unfortunately, was not tested.

In a case reported as puerperal tetanus by Dr. Angus Macdonald² the autopsy revealed blood-clots filling the lateral ventricles and small extravasations in the corpora striata. The patient had been unconscious, and had had stertorous breathing. It was evidently not tetanus. The custom, which appears to have prevailed more in the past than it does in the present, of calling spastic or tonic states of the muscles "*tetanoid*," is a bad one, as the term is a misnomer, and is responsible for the report of some cases which have been erroneously classed with the cases of true tetanus following abortion and labor.

The question may arise whether a septic meningitis of the spinal or cerebro-spinal type may occur after a miscarriage or the puerperium, and be mistaken for tetanus. Not a few of these reported cases have evidently had a septic element in them. Simpson speaks of a patient passing fetid clots from the vagina. One of the cases reported in India had a purulent discharge from the vagina, following a craniotomy. The conditions are very favorable to septic infection in many of the cases reported, as the tetanus in them followed dystocia, flooding, adherent placenta, introduction of the hand, etc.

The effect of severe hemorrhage in causing convulsive phenomena was pointed out by Marshall Hall and others. McGugin³ gives a fatal case of tetanic rigidity after profuse hemorrhage. Such a case would probably be soon apparent and rapidly fatal, and not be likely to be confounded with true tetanus, which usually comes on several days after labor and its accidents.

PROGNOSIS.—Tetanus is an exceedingly fatal disease, and not less so after abortion and labor than in surgical practice. According to Dr. Garrigues' statistics, of 25 cases of tetanus due to abortion, 23 died; of 32 cases following parturition, 27 died. Of cases which I have collected, not included in these statistics, the almost uniform result has been rapid death. The duration of the disease varies. Of the above cases in which the duration is stated, the figures are as follows: Of 22 cases following abortion, 19 lasted from one to eight days; of 25 cases following parturition, 22 died within the same short space. The longest time observed definitely was twenty days. Dill⁴ reports a case of recovery in a woman who was ill seventy-two days; her mind was affected. It is doubtful if the case was tetanus.

I do not know whether the relative mortality is higher in puerperal

¹ *Med. and Surg. Reporter*, Sept. 20, 1873.

² *Trs. Edinb. Obst. Soc.*, 1878, iv. 101-116.

³ *Op. cit.*

⁴ *Brit. M. J.*, 1882, ii. 685.

than in non-puerperal cases. It is possible that the special conditions of the puerperium may render a patient less able to withstand such a terrible malady. Conner¹ gives the following figures from traumatic cases in civil and military hospitals for thirty years: Of 1332 cases, 1060 were fatal (79.6 per cent.).

TREATMENT.—The treatment of tetanus is one of the opprobria of therapeutics. It is one of the most hopeless tasks, apparently, to combat it with the remedies used in the past, if we except two or three. Chloral, the bromides, cannabis India, and Calabar bean have been especially recommended, and have had, next to opium, the most extensive trial. From the standpoint of physiological therapeutics it would seem that most of these drugs are admirably adapted to control tetanus but in practice they have often failed.² This failure may have been due sometimes to the timid or inexperienced way in which they have been used, or to the inertness of the drugs. It requires a finely-balanced mind, as Sir Thomas Watson observes, to conduct a duel between two opposing agents, either of which may kill the patient in the fray. Many practitioners will not have courage to push Calabar bean, as Ringer suggests, till “just short of arresting the breathing.” This is a feat in which the physiological therapist only in his laboratory can hope to succeed, and then upon a dog or a rabbit only.

I believe that chloral and the bromides are probably the best remedies, just as they are the most familiar agents, in the hands of the general practitioner. The other substances may be inert as found usually in the shops, and their action is not as well known to many as that of the others. Opium and its preparations have been much relied upon, although recently I have heard theoretical objections urged against them. Hutchinson found opium the most useful remedy for lockjaw in sheep which had lambed.

Inhalations of chloroform or ether appear to promise much, but they have often been disappointing. The tetanic spasm may be overcome temporarily, but as soon as the anæsthetic effect passes away the tetanus is apt to recur.

The great difficulty often encountered in treating tetanus is the almost impossible administration of food and medicines by either the mouth or rectum. In a rapidly fatal case I have seen any attempt to give fluids by the mouth bring on violent spasm, opisthotonos, embarrassment of respiration, and choking which made further attempts simply out of the question. When the trial was made by the rectum a spasm would almost invariably occur and expel the fluid violently. The skin can of course be used for medication with some substances, but nourishment by it cannot support the system in the rapid exhaustion which sometimes comes on.

¹ *Am. Syst. Med.*, art. “Tetanus.”

² See Wood's *Therapeutics* for some statistics.

For more elaborate details of treatment reference must be made to the general works on therapeutics and special works on tetanus, the remedies for which are the same in puerperal as in other cases.

The facts that many reported cases have followed adherent placenta, and that some of them have had the symptoms of septic infection, suggest the necessity in these puerperal cases of careful examination of the womb and removal of any remaining débris. It is doubtful, however, if such care could modify the disease after it is once declared; for, even supposing a local septic infection, the mischief has been done; but the propriety of such care as an extra safeguard cannot be questioned.

TETANY.

Several forms of rigid or tetanic spasm have been described by various writers, some of which have been noted in pregnant women especially. They have been called "tetanoid spasm," "intermittent tetanus," and "tetany." I believe that the majority of the cases described under these names are hysterical, and in no sense related to true tetanus. They will not, therefore, be separately described in this paper. Hysterical cases are nearly always to be distinguished by altered states of consciousness and the emotions which are not observed in tetanus, as well as by an intermittency of the paroxysms and a general bizarre aspect of the case, which is not usually difficult to recognize. Tetany, however, appears to be a distinct, somatic affection, without special psychic or hysterical phenomena, which has been observed and described by the French especially. Very few instances apparently of this affection in childbearing women are seen in this country. Trousseau¹ has a long descriptive chapter on the disease, in which he reviews its history, symptoms, etc. He says that it is seen in nursing women especially, and speaks of having observed more cases of it in a ward devoted to wet-nurses than all other cases combined. Hervieux² also has an elaborate chapter on the subject, but it is founded on very few cases, and these not observed by himself. He confines his description to cases happening during pregnancy, some of which have been fatal, and are possibly distinct from the simple tetany of nursing women. In fact, the cases reported in detail are few, and the disease, with all its classic features, appears to be traditional with some writers as a distinct entity in pregnant and nursing women. Loss of blood, prolonged lactation, diarrhœa—in short, various exhausting accidents or processes—appear to be important factors in its causation, and suggest the likelihood of the disease being practically identical with the cramp-like seizures which occur in cholera and choleraic diarrhœa. The fact, again, that the tetanic symptoms can be brought on by pressure upon the blood-vessels

¹ *Clinical Lectures*, New Sydenham Soc., vol i. 370.

² *Op. cit.*

and nerves of the limbs gives them a partial resemblance to the painful cramps which some women suffer during labor when the advancing head irritates the nerves and compresses the vessels.

Tetany, as described, is characterized by painful, intermitting, cramp-like spasms, of the extremities especially, often exclusively. These spasms are apt to begin in the fingers or toes and to advance up the limbs. In severe cases the muscles of the trunk may be involved, causing rigidity of the neck and opisthotonos, although this latter appears to be rare. The fingers may be flexed into the palm: a more common form, however, is the so-called "obstetric hand," in which the fingers are held together at the ends as the obstetrician holds them for introduction into the vagina. The attack commences with a sensation of tingling in the fingers and toes, and is sometimes marked with anæsthesia.

The distinctions between tetany and true tetanus appear thus to be easily made. Tetanus begins in the jaws and neck, and is most marked in the trunk; tetany is especially seen in the extremities. The latter, again, is markedly intermittent, and, while painful, is benign; the former does not completely intermit, and is often rapidly fatal. Gauchet¹ has described the most characteristic case of these peripheral cramps spreading from the fingers and toes upward, accompanied with pain. The patient slowly recovered after labor.

It is not necessary to enumerate the various antispasmodics, most of which have not been very efficacious in these tetanoid seizures. Bromide of potash has relieved tetany in children. Trousseau advocated ice to the spine. The removal of the cause, as diarrhœa or prolonged exhausting nursing, is indispensable.²

EPILEPSY IN PREGNANCY.

This subject is of practical importance chiefly as it concerns the differential diagnosis of epilepsy from hysteria in pregnant women and from puerperal eclampsia. It has also occasionally been brought into prominence by the revival at stated intervals of an old belief that pregnancy has a beneficial influence upon epilepsy. Again, it has been asserted that pregnancy has been the starting-point or original exciting cause of epilepsy; and, finally, some observations are of record which tend to prove that pregnancy, instead of relieving, has tended to aggravate pre-existing petit or grand mal.

It appears very evident, from some reports of cases, that the older observers failed to distinguish true epilepsy occurring in pregnant women from attacks of hysteria. Women whose convulsive disorders are most apt to appear about the menstrual periods, and whose fits last

¹ *Union Med.*, 1860, vii. N. S. 309.

² For a description of tetany in all circumstances see Gowers' *Dis. Nerv. Syst.*

for almost an hour, are probably hysterical. These manifestations may continue during pregnancy, and may thus confuse the diagnosis. The history of the cases, the psychic disorders, the prolonged duration of the attack, the fact that the hysteric spasms are rather rigid, opisthotonic, and indefinite, in marked contrast to the short, furious characteristic clonic spasms, with profound unconsciousness and biting of the tongue, which identify epilepsy, are some of the diagnostic data upon which a differentiation can be based with confidence.

The diagnosis of puerperal eclampsia from epilepsy cannot ordinarily, at this date, present difficulty. The easily recognized uræmic origin of the former, its abrupt beginning, and the absence of a history of such seizures; the albuminous, even bloody, urine; the œdema, the precedent headaches and dimness of vision; its frequent returns at brief intervals and intermediate coma; its occasional epigastric pain or crisis; its rapid course and often fatal termination,—all characterize a disease which is essentially distinct in origin, pathology, and clinical history from epilepsy, to which it bears only a superficial resemblance in its convulsive phenomena. It had been confused with true epilepsy before its uræmic nature was recognized.¹ I have recently had in practice a case of puerperal eclampsia in which intense pain in the epigastric and umbilical region was a marked prodromal symptom, and preceded the first convulsion at least four hours. It was a third pregnancy. The patient recovered. I thought the abdominal pain might be due to a congestion of the kidneys.

Many writers apparently have believed that pregnancy can and does influence epilepsy for good. This belief appears to be traditional, and is probably one of the numerous popular notions which have sprung up about the mysterious *morbus sacer*. Physicians have been influenced by this tradition, and have simply given it expression without always subjecting it to necessary criticism or verifying it by observation. Velpeau² says it is proved by many facts that pregnancy is able to suspend ordinary epilepsy, and he himself knew of an example. Tyler Smith³ collected 15 cases of epileptics who had been pregnant, the cases giving a total of 51 pregnancies. He says that “generally the epileptic attacks were fewer, and in some cases disappeared altogether, during gestation.” This paper has a firmer foundation upon recorded cases than most papers on the subject: the one element of doubt is whether some of these cases were not hysterical women. Echeverria,⁴ whose work appears, on this subject at least, to be rather a compilation than a critique or a record, gives the names of Van Swieten, Schenkinius, Tissot, Maissonneuve, Herpin, Sieveking, and others who

¹ See discussion in *Lancet*, 1849, xxiv. 644.

² *Des Convulsions chez les Femmes, etc.*, 1834.

³ *Lancet*, 1849, loc. cit.

⁴ *On Epilepsy*, 1870.

give examples of epilepsy being arrested by gestation. Gowers¹ says: "In most cases of epilepsy the attacks do not occur during the puerperal period;" but this period is very variable with both patients and their physicians. We have epileptics in the Philadelphia Hospital who have borne children, but I am not able to make a more accurate statement than one based upon the reports from memory of these women themselves. Any report to be accurate ought to be based upon a thorough knowledge of the relative frequency of the fits for a long time before as well as during pregnancy; and such records have not been kept. The following are brief notes of some of these cases:

Mary L——, aged 44 years, had her first fit when nine years old. She says it was due to fright, as not a few epileptics claim. In her case it was caused by a fall into a river. She has had nine children, and says that she never had a fit during any one of her nine pregnancies. The seizures have always reappeared a few days after labor. This patient has very bad epileptic spasms, with loss of consciousness and frothing at the mouth. She invariably cries out "Fishes!" makes a motion as though to pick something off her dress, and falls convulsed. She has frequently injured herself in her seizures. The fits come about two months apart, and have never intermitted as long as nine months except during her pregnancies. She is a reliable woman of some intelligence. None of her children have been epileptic. I think her statement is authentic.

Matilda G—— is a confirmed epileptic. She has mental deterioration with loss of memory. She had one child about nine years ago. Her account is of no value.

Ellen L——, who is reported as an epileptic, had her first fit about the time of the birth of her first child, and another after the birth of the second. The urine was not albuminous. This patient also is very stupid, and her account cannot be accepted.

Two other patients give such indefinite histories that it is not worth while to print them. One is probably a case of hysteria. These five cases show how difficult it is to secure reliable data upon which to base an opinion. One of T. Smith's cases is reported to have passed through ten pregnancies without a convulsion.

When we reflect that epilepsy is rather a symptom than a distinct, always identical, disease, and that it may depend upon widely differing irritations and alterations in the cerebral cortex, it will be seen at once how unreliable any general statement must be that pregnancy always modifies it at all or in any particular way.

Before the mæmic origin of eclampsia was recognized another notion prevailed, that an epileptic who became pregnant was more liable than other women to have puerperal convulsions. This mistake is easy

¹ *Dis. Nerv. Sys.*

enough to understand. The fits of the epileptic happening toward the close of pregnancy or in the puerperium were probably called "puerperal convulsions." There is no especial reason why an epileptic should have the characteristic changes in the kidneys and urine upon which puerperal eclampsia depends; and the belief could only have arisen from the general tendency to confuse the two species of convulsions. In the discussion following Dr. Tyler Smith's paper this confusion was manifest in the remarks of some. In the 51 pregnancies in epileptic women reported in that paper only 2 cases of "puerperal convulsions" were observed, but the condition of the urine is not stated.

Finally, with reference to the statements that pregnancy has been the primary exciting cause of epilepsy, and that it has aggravated cases already established, the observation, I believe, will hold good that most of such statements are of a very general character, and that some of the cases are capable of a different interpretation. Reynolds¹ says that epilepsy may be induced in pregnancy "by some unknown circumstances determining a relative excess of change in the medulla" during the general change of that process; but nothing more definite and satisfactory. Terrillon² gives full details of a case of epilepsy in which the attacks were worse during pregnancy. Some reported cases were probably uræmic, as Durrant's,³ whose patient, aged twenty years (probably a primipara), had her first fit in the eighth month of pregnancy, and continued to have fits for four months afterward.

Echeverria⁴ has recorded an authentic case of epilepsy which first appeared in a first pregnancy. The attacks recurred in and after every subsequent pregnancy, and were accompanied after labor with mania. The patient had borne six children, all but the first epileptic. The seizures were nocturnal, the patient frothing at the mouth and biting the tongue during the paroxysm. She was positive that she never had attacks except during her pregnancies, but as the seizures were nocturnal, we cannot be sure of this asserted fact.

I think the general conclusions can be allowed that as the pathology of epilepsy is little understood, and probably varies in different cases, it is impossible to give an exact categorical statement of the effect, either good or bad, of such a process as pregnancy upon it; that clinical observations appear to prove that in occasional cases of epilepsy the attacks are less frequent during pregnancy, but that in very rare cases they are increased; and that, finally, the older observers have sometimes confused hysteria and uræmic convulsions with so-called essential epilepsy.

¹ *Syst. of Med.*, art "Epilepsy."

² *Ann. de Gy.*, June, 1881, 401.

³ *Proc. M. and S. Journ.*, 1845, vol. ix. 610.

⁴ *Op. cit.*, p. 222.

CEREBRAL HEMORRHAGE AND EMBOLUS IN PREGNANCY AND THE PUERPERIUM, AND PRESSURE-PALSIES FOLLOWING LABOR.

It is intended to write a brief notice only of these subjects, and to emphasize in it the etiological relation only of pregnancy and the parturient processes to several forms of paralysis. There is no such thing as a "puerperal paralysis"—which is a term used by many authors—if anything special or distinct is meant by that expression. The progress of pregnancy or labor may be marked or followed by several forms of loss of power—hemiplegic or localized—some of which are directly traceable to those processes as exciting or essential causes, but which in themselves are in no way different from these palsies happening in other circumstances. Therefore, these affections are probably best and most appropriately described in general textbooks of medicine or in special treatises on neurology. For the present purpose I will note simply a few essential facts: first, about hemorrhage and embolus in the cerebrum; and, second, about that particular paralysis which is more distinctly "puerperal" than all others—*i. e.* the loss of power which characterizes a neuritis of one of the main trunks of the leg, caused by pressure of the child's head during labor. Other forms of paralyzes occasionally happen, due to hysteria, or, worse yet, to septic infection.

Authors, both ancient and modern, have had a great deal to say about the so-called puerperal paralyzes. Hervieux,¹ with his accustomed diligence, has made a long collection of these writers, and has presented their chief ideas. From these it is evident, as might be anticipated, that the diverse forms of paralysis had not always been differentiated, the various apoplectic, convulsive, and comatose states being more or less confused. The pathology is peculiarly archaic, and contemplates the milk and lochia as the chief causes of these disorders, especially when either of these fluids is suppressed. Churchill,² years ago, composed a lengthy article on paralysis occurring during gestation and in childbed. He collected in his paper 34 cases from various sources. A brief critical survey of these cases shows very clearly that they are a heterogeneous lot, many of them mere coincidents of gestation and labor, the whole number exhibiting a variety of pathological states. An accurate diagnosis is impossible in some cases because of the very meagre details with which they are reported, but the following is Churchill's own classification, slightly modified: Hemiplegia, 19; paraplegia, 4; facial paralysis, 6; amaurosis, 5; deafness, 3. Several patients are included twice in this list. Some of these cases of hemiplegia were evidently hysterical, as in one woman who had hemianæsthesia coming and going. These were the cases which recovered. But in the cases

¹ *Op. cit.*

² *Dublin Quart. Journ. Med. Sci.*, vol. xvii.

in which the hemiplegia was evidently due to cerebral hemorrhage or embolus the course was the same as in these cases under all circumstances: they did not completely recover, and some of them died. The paraplegias were either pressure cases of neuritis or due to spinal meningitis, possibly septic: one of these women stood in water up to her knees while at work on the eighth day after labor. The facial paralyzes (Bell's palsy) were without exception simply cases of acute inflammation of the seventh nerve happening accidentally in pregnancy or the puerperium. The instances of amaurosis were in cases of puerperal uræmia, some of them with convulsions, in which the obscuration of vision was merely a symptom of this toxæmia, as is frequently observed. The same may be said of deafness. It thus appears that if we deduct the hysterical, uræmic, and merely coincident cases, we have remaining a very few cases of organic brain, cord, and nerve lesions which probably owed to pregnancy or parturition an exciting cause.

Imbert-Goubeyre¹ has written an elaborate paper on these paralyzes, in which he classifies in divisions and subdivisions almost all possible forms of paralysis which the childbearing woman may suffer. Such a paper to be complete ought to be little less than a treatise, clinical and pathological, on this department of neurology, because only in such a treatise could these diseases be studied with profit. Most of them, as already said, bear to pregnancy and parturition only an accidental relationship; and it is sufficient for the purpose of this paper simply to state and illustrate that fact.

We ought to distinguish at once those cases in which these accidents are simply coincidents, and not directly related to the physiological processes now considered. Apoplexy has been reported in pregnant women, but I do not know that pregnancy has any especial influence to produce it. The supposition does appear reasonable, however, that the plethora of pregnancy, hence the increased blood-pressure, may act directly here to precipitate the attack, when the blood-vessels have been previously weakened by atheromatous disease or the kidneys and heart have been conjointly involved in that general state of arterio-capillary fibrosis which favors this accident.

Embolus in a cerebral artery is most frequently the product of an endocarditis. The small fibrinous mass is swept off by the blood-current and lodged in one of the vessels of the brain. The relation of pregnancy and labor to this pathological process can, therefore, be only incidental. The nature and extent of the symptoms in these cases will depend entirely upon the size and distribution of the vessel occluded. As a matter of fact, the left cerebral hemisphere is much more frequently invaded than the right, because the blood-current is more direct to that side through the left carotid artery, which springs immediately

¹ "Des Paralysies puerpérales," *Mém. de l'Acad. Imp. de Méd.*, tom. xxv.

from the aorta. The resulting paralysis may be a hemiplegia, a monoplegia, or an aphasia, according to the individual arterial trunk or branch which receives the embolus. A quite large proportion of the cases of "puerperal paralysis" reported appear to have been aphasia, or loss of power of word-thinking, depending, doubtless, upon the stoppage of the vessel which supplies the cerebral cortex about the island of Reil and the posterior part of the third frontal convolution on the left side. Poupon¹ has written a special paper on "puerperal aphasia," but to show how free the admission is to this class for all kinds of cases, he quotes a case of aphasia alleged to be caused by fecal accumulations and said to be cured by their expulsion. Cazeaux calls attention to the alleged fact that most paralytics reported in obstetric practice have recovered before or after delivery. This is a broad statement, and appears to me doubtful; but it does seem to be a fact that very many of these cases have been reported as improving. It may be, as already seen, that a proportion of hemiplegies and aphasics reported after labor have been hysterical. I have certainly heard by common report of complete cures of puerperal hemiplegia which do not admit of any other interpretation, because the prognosis of hemiplegia caused by either embolus or cerebral hemorrhage is not good for complete cure. No valid reason can be urged why this rule should not hold true in puerperal cases with the same lesions; in other words, the pregnant or puerperal woman with a clot or embolus in her brain has no better chance of recovery than a man or a non-puerperal woman who has suffered this accident. In this connection it may be proper to call attention to some of the distinctions of hysterical hemiplegia. In this affection the paralysis of the leg is worse than that of the arm, while the face is little if any affected. Hemianæsthesia is apt to coexist along with more or less complete paralysis of the special senses. Stiffness may occur, but is not quite as marked as the secondary contractures of genuine hemiplegia. Exaggerated knee-jerk is not marked and true ankle-clonus is not observed in hysteria. Mental and moral symptoms of a characteristic kind are apt to be observed, while if the speech is affected it is not improbably an aphonia rather than an aphasia. Hysterical or simulated aphasia, however, has been observed. Bed-sores are not common in hysteria.

In the days when uræmia was first recognized as a result and complication of pregnancy it was not uncommon to consider it a cause of the hemiplegia sometimes happening during gestation or the puerperium. In fact, it seemed about to take the place which the lochia and the milk had formerly occupied in the humoral pathology, and to have ascribed to it all the nervous accidents, as convulsions, paralysis, and even insanity, which were formerly attributed to a suppression of those

¹ *L'Encéphale*, 1885, p. 393.

fluids. Eclampsia is doubtless of uræmic origin, but paralysis, as hemiplegia or other variety, must certainly be very rare as a lasting result of the acute nephritic disorder which sometimes complicates pregnancy and labor and produces convulsions. I am not prepared to say that lasting paralysis has never happened after eclampsia, but if so it must have been caused by some unusual damage to the cerebral blood-vessel system due to the violence of the convulsive excitement. It is quite different, of course, in cases of long-standing Bright's disease, in which arterial degeneration may have occurred. Hemiplegia as a result of such arteritis is not uncommon, and may of course occur in pregnant women if their kidneys have long been the seat of disease; and in such cases the pregnancy or labor, because of the strain it puts upon the arterial system, may be the direct exciting cause of the mishap. Such a hemiplegia would not necessarily be preceded by a convulsion.

Inflammation of the spinal meninges has probably occurred in some puerperal cases and caused paralysis of the lower extremities. This complication is possibly of septic origin. Something like it has been observed in the lower animals. Churchill, in his paper already mentioned, quotes instances from veterinary writers of cows and mares suffering with paraplegia following the onset of a metritis. The inflammation in these instances spreads from the womb to the spinal canal, probably by the connective tissue, vessels, or, as some have supposed, by an ascending neuritis. If of septic origin it is purulent. The symptoms of spinal meningitis are those, first, of irritation. Pain is felt in and along the spine and radiating around the body, giving the constriction sense, and along the limbs. The muscles of the back are apt to be tense and rigid, and those of the legs weakened on voluntary movement, but much excited in their reflexes. If, however, the inflammation involves the lumbar enlargement, the reflexes are abolished and the muscles flaccid. Paralysis of the bladder may cause retention of urine, or reflex irritation of it may cause occasional incontinence. Hyperæsthesia is often present. The symptoms, second, are those of weakness, as have been already indicated—*i. e.* loss of power on volition. The reflex arc for the legs passes through the lumbar enlargement; hence if this is invaded the reflexes are abolished, and, the bladder being paralyzed, retention, with possibly dribblings of over-flow urine, occurs. If the anterior horns of the gray matter or the anterior nerve-roots are involved, rapid wasting of the muscles follows.

We have finally to consider the paralysis which results from injury to the sacral plexus or the sciatic nerve, caused by pressure of the child's head during its passage through the pelvis. There can be no doubt that this accident occasionally happens, because authentic cases of it are on record; and when we consider the anatomy of the parts, the

wonder arises that it does not occur more frequently than it appears to. I have not made an extended search of the literature to determine, if possible, this frequency, but I have been somewhat surprised to find in a cursory view of this subject that the *relative* number of cases must be very small. Imbert-Gourbeyre thinks trauma during labor very rare as a cause of paralysis. He gives three cases which seem to have been due to pressure of the head on the sciatic nerve. Ramsbotham also refers to such cases. Women not infrequently complain of pains shooting down the legs during labor when the head is well engaged in the pelvis, also of very severe and painful cramps in the muscles of the thighs and legs. These pains are doubtless due to pressure of the head upon the nerve-trunks or plexus, and the cramps may possibly be caused by pressure upon the blood-vessels in addition. I have never observed any persistent weakness in the legs in these cases, although I have looked for it. It is just possible that slight transient weakness of one or both legs in the puerperal woman may be overlooked occasionally, because the patient is kept so carefully at rest in bed during the first two weeks. A mild pressure-palsy could recover in that time, as I have seen it do in other parts. Paresis has been reported after short and comparatively easy labors, as well as after severe, protracted, and instrumental deliveries. From an actual dissection of the pelvis made recently, by the kindness of Dr. Deaver in the University of Pennsylvania, it appears to me, from the position of the sacral plexus, that posterior positions of the vertex would be most likely to produce a pressure-palsy. I do not know whether clinical observations confirm this.

Dr. F. X. Dercum has given me the following details of an interesting case of atrophic paralysis following labor: A woman about twenty-five years of age suffered with pain and weakness of the right leg after an instrumental delivery. This confinement was followed twenty months later by another, also instrumental and very difficult. Complete palsy of the right leg, except perhaps the anterior thigh-muscles, now followed. Two years later marked wasting with contractures of the muscles of the affected leg was present.

The symptoms of a pressure or traumatic lesion occurring during parturition are apt to be both sensory and motor: they are, in fact, the symptoms of a neuritis, which is the pathological state probably in these cases. Along with the paralysis wasting of the muscles occurs. If the sacral plexus and the small sciatic nerve are involved, paralysis of the gluteus maximus is present, causing difficulty in rising from the sitting position, and producing anæsthesia of the mid-region of the back of the thigh and the upper part of the calf. If the trunk of the large sciatic only is involved, paralysis of the flexors of the leg and of the muscles below the knee, with loss of sensation over the outer

part of the leg, most of the dorsum of the foot, and all of the sole, is present. These regions of anæsthesia are those indicated by Gowers,¹ and are according to the distribution of the sensory nerves to the parts, except, in addition, that the small sciatic nerve supplies with sensation the perineum. Other branches of the plexus supply some of the smaller and deeper-seated muscles of the pelvis and buttock. The anterior crural and the obturator nerves also have, so it is said, been injured in parturition; but the position of the anterior crural certainly does not expose it to as much risk as in the case of the great sciatic. It supplies the extensors especially of the leg (the anterior thigh-muscles) and the skin of the front and both sides of the thigh, and the inner side of the leg. Paralysis of motion and sensation in these parts would therefore be caused by injury to this nerve; also—a very significant symptom—abolition of the knee-jerk. The obturator nerve supplies the adductor muscles especially of the thigh, the paralysis of which prevents the patient from crossing the affected leg over the other. It occasionally supplies a sensory filament to the inner aspect of the thigh. More minute studies of these nerve-distributions may be made, but the above is at least a practical, applicable knowledge, and if once appreciated may occasionally assist the obstetrician to an early recognition of a very unfortunate complication. Dr. Howard A. Kelly informs me that he has observed sciatic pains persist after the puerperium, the true nature of which pains had been overlooked. By digital examination through the rectum he has made pressure upon the nerve-trunk or plexus in these cases, the patients always exclaiming at once that the seat of pain was under the finger. The atrophy of the muscles which occurs in neuritis is according to the well-known law that when a muscle is cut off from its trophic centre in the spinal cord it wastes: it will while wasting present certain changes in its reactions to electricity known as the reactions of degeneration. These phenomena still further assist the diagnosis, but must be studied in special works on the subject.

As a practical point, it may be well to state that a number of observers have recorded that women who have suffered a hemiplegia of cerebral origin during pregnancy have passed through their labors happily and without any special difficulty due to their impairment. The treatment of these various lesions, when treatment is applicable, must be sought in works on diseases of the nervous system.

¹ *Op. cit.*, vol. i.

THE MANAGEMENT AND THE DISEASES OF THE NEWBORN INFANT.

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NEW YORK.

THE management of the newly-born infant at birth has been fully treated of in Volume I. It remains for us to consider the subsequent care of the infant and the diseases to which it is liable during the first weeks of life.

CARE OF THE INFANT.

ALIMENTATION.—The natural mode of feeding—that is, by the mother's milk—should always be recommended unless in those exceptional instances in which mothers are incapacitated by physical ailments or mental derangement. The common practice in wealthy families of employing wet-nurses, in the belief that suckling their infants deprives mothers of social enjoyments, and by the drain upon the system impairs their general health, should be discouraged. Wet-nursing by the mother, if properly regulated, with sufficient undisturbed sleep at night and with the maintenance of good appetite and digestion, does not impair her health, but, on the other hand, as shown by Dr. Joseph E. Winters and others, tends to promote her physical well-being. On the other hand, mothers seriously sick, unless their maladies be of short duration, should not suckle their infants: disastrous consequences follow if they attempt it. Mothers with phthisis, cancer, or other organic disease which impairs the general health or diminishes the appetite should never be allowed to wet-nurse their babies. Wet-nursing under such circumstances aggravates the disease, and the milk which such mothers furnish, even if sufficient in quantity, is deficient in nutritive properties.

Under ordinary circumstances the infant requires no food but the mother's milk until the age of six months, after which it is proper, and often necessary, to give some additional nutriment, since at this time the mammary secretion begins to diminish.

The baby should take the breast when the mother has recovered from the fatigue of her confinement, or in about six hours after birth. It may be applied to the breast every hour when the mother is awake until the age of three weeks. The milk is not secreted in quantity sufficient for nutrition until the third day, but there is a prior secretion of colostrum which the baby receives, and which by its laxative action aids in the expulsion of the meconium. The early application of the child to the breast has this beneficial effect—that it promotes the mammary secretion and renders it less difficult for the infant to grasp the nipple when the breast is distended with milk. The very common practice of untrained nurses and female friends of giving to the baby various sweetened mixtures as soon as it is born, and administering them from the first day onward whenever it frets, in the belief that it is hungry or that it has colic which fennel, catnip, or aniseed with sugar will relieve, should be forbidden. The child thus treated soon has stomatitis with sprue. It nurses less frequently, and is more fretful on account of its distended stomach and sore mouth, and the mother's breasts, lacking the proper stimulation, yield less milk. The infant will not suffer if fed nothing but the scanty mammary secretion until the third day. At and after the third day, if the supply of milk be inadequate, the deficiency may be supplied for a few days by the use of one part of selected cow's milk and three of water, with the addition of a little lime-water. Cow's milk, however fresh, is acid, while human milk is alkaline.¹ Hence the addition of lime-water sufficient to produce alkalinity.

The preference must always be given to the mother's milk if she be well, and only that amount of cow's milk should be given every fourth hour as will supply the deficiency. The great majority of mothers need no such aid in nourishing their infants, and artificial feeding, when it is not required, is pernicious. Over-feeding of young babies, as well as of those who are older, results disastrously in producing indigestion, colic, diarrhœa with unhealthy stools, and sometimes gastro-intestinal catarrh, with subsequent loss of flesh and strength. It is important that the accoucheur should have clear and definite knowledge of the amount of nutriment required by the newborn infant.

A few years since Drs. Chadbourne, Parker, and myself made observations in the New York Infant Asylum and New York Foundling Asylum in order to determine how much food children required at different ages. Those selected for observation were well nourished, and they were accurately weighed before and after each nursing or feeding

¹ In two localities in Central New York the milk of 27 healthy pasture-fed cows was tested, at my request, by litmus-paper at the time of the milking, and in every instance it was slightly acid.

during twenty-four hours. Eleven infants under the age of three weeks, who took the breast, with three exceptions, twelve times in the twenty-four hours in which they were under observation, were found to take in the average, during the day, 12.55 ounces, as seen by the following table :

No.	Name.	Age.	No. of Nursings.	Milk Nursed in 24 Hours.		
				Quantity in Weight.		Quantity in Fluidounces.
				Oz.	Dr.	
1	Josephine Foley	17 d.	11	10	$\frac{1}{2}$	9.75
2	Henry Cunningham	16 d.	9	13	5	13.24
3	Henry Jackson	19 d.	9	10	3	10.07
4	— Rake	5 d.	12	22	7	22.22
5	Henry Benton	6 d.	12	15	$5\frac{1}{2}$	15.25
6	Wm. Fletcher	5 d.	12	10	$1\frac{1}{2}$	9.88
7	Nora Hastie	14 d.	12	17	3	16.85
8	Carl Flask	5 d.	12	5	4	5.37
9	Clarence Humphrey	1 m. 5 d.	8	11	$1\frac{1}{2}$	10.84
10	Frederick Dighle	7 d.	12	14	4	14.08
11	Edward Stace	6 d.	12	8	1	7.74
12	Rosa Brown	3 w.	12	14	1	13.68

Rotch¹ has endeavored to ascertain the normal capacity of the stomach in infancy. A difficulty arises in such examinations on account of the distensible state of the stomach in young infants, but he states that this organ at the age of five days holds only six and a quarter fluidrachms without distension. The stomach of the young infant appears, however, to increase in size and capacity more rapidly than the system generally. Thus, according to Frowlawsky, if 1 represents the growth in the first week, $2\frac{1}{2}$ represents it for the fourth week, $3\frac{1}{2}$ for the eighth week, $3\frac{1}{3}$ for the twelfth week, $3\frac{1}{2}$ for the sixteenth week, and $3\frac{2}{3}$ for the twentieth.

Ssnitkin of St. Petersburg has prepared a formula for determining the quantity of food required by young infants, which he believes to be a safe and reliable guide. It is based on the weight of the infant. According to his observations, the greater the infant's weight the greater is the capacity of the stomach ; and he believes that the infant at birth requires one one-hundredth part of its weight of food properly prepared and of proper consistence for each feeding, and 1 gramme or 15 minims in addition should be added each day. Thus, if the infant at birth weighs $6\frac{1}{4}$ pounds or 100 ounces, it requires 1 ounce at each feeding ; on the second day it requires 1 ounce and 1 drachm ; on the third day, 1 ounce and 2 drachms, etc.

Rotch² has prepared the following table to indicate the amount of food required at each feeding, according to the age :

¹ *Arch. of Pediatrics.*

² *Ibid.* ; *Annals of Univer. Med. Sci.*, vol. iv., 1888.

Age.	Intervals of Feeding.	Average Amount at each Feeding.	Average Amount in 24 Hours.
1st week	2 hours .	1 ounce . .	10 ounces.
1-6 weeks	2½ " .	1½-2 ounces . .	12-16 "
6-12 weeks, and possibly to 5th or 6th month	3 " .	3-4 " . .	18-24 "
At 6 months	3 " .	6 " . .	36 "
" 10 "	3 " .	8 " . .	40 "

It is seen that the estimates by Drs. Ssnitkin and Rotch agree nearly with the observations made by myself as regards the amount of food required by infants under the age of two or three months; but the food, in order to have these estimates correct, should have the consistence and nutritive properties of human milk. When, as is sometimes the case, too large a proportion of water is added through the ignorance or carelessness of the nurse, of course the quantity required would be greater than when the proper amount of water is employed, and the stomach might be temporarily over-distended; but the excess of water is quickly eliminated from the system through increased urination or thin and more frequent stools.

The above statistics correspond with those of other observers. They show that infants under the age of three weeks take, on the average, about half the milk required by those over the age of two or three months. After the third week the amount required for healthy nutrition increases with the progressive growth of the infant.

If for any reason the mother be unable to suckle her infant, of course some other provision must be made; but many mothers are discouraged by trivial causes, and will resort to bottle-feeding when by a little patience and encouragement they might perform fully the duties of wet-nursing. The physician should encourage the mother disheartened by the pain of sore nipples or temporary indisposition to persevere in suckling her infant, unless her condition be such that wet-nursing is impossible without risk of injury to herself or the child. By the close of the second or third week her ability or incapacity for wet-nursing will be apparent, and if she be incapable of the task a wet-nurse must be employed or artificial feeding resorted to. In the city the preference should be given to the wet-nurse if one with proper qualifications can be obtained and the family can incur the expense; but in the country it is probably better to employ artificial feeding, and it is often necessary in the city on account of the expense and difficulty of obtaining proper wet-nurses. Therefore how to feed a baby deprived of the breast milk is one of the most important problems which the physician is called upon to consider.

Dr. Arthur V. Meigs recommends the following food as a substitute for breast milk: "One quart of milk is placed in a vessel—a tall, narrow pitcher is best—and after standing for three hours the upper

pint is slowly poured off. This contains the greater part of the fat (cream), and when the child is to be fed there should be mixed together three ounces of this cream, two ounces of lime-water, and three ounces of sugar-water, which must be made in the proportion of eighteen drachms of milk-sugar to one pint of water. This makes eight ounces of food, which of course is much too large an amount for a young infant or one that is ill. If, therefore, the infant is young, only two to four ounces will be needed at each feeding, and only that quantity should be prepared," the proportions mentioned above being preserved. "The directions given are those for the feeding of a healthy infant between two weeks and six to nine months of age."¹

Whatever food is employed, cow's milk must in this country be its basis, and the utmost pains should be taken to secure good milk. The milk of stabled cows in or near the city should be discarded, and that obtained from dairies in the rich farming sections should be used. Cows that have the range of pastures and feed upon grass and clover, and in the summer months lie upon the grass, and in the winter have clean stalls and plenty of straw to lie upon, have better health, cleaner udders, and furnish better milk than the constantly-stabled cows in the city, or those with limited and scanty pasturage in the city suburbs. The dairymen should be required to follow strictly the excellent rules prepared by Prof. Vaughan for the care of the cows and management of the milk. Inquiry should be made if the cows have pure drinking-water, if noxious weeds are removed from the pastures, if no decaying cellar or kitchen refuse be fed them, and their udders are clean at the time of the milking.

Not less important is the management of the milk. Scalded and clean milk-pails and milk-cans should be employed, and immediately after the milking the uncovered pails or cans should be placed in cold running water or surrounded by ice, so as to remove the animal heat and reduce the temperature to sixty-five, or better to sixty, degrees. The milk should then be covered, and except in the coldest weather should be constantly surrounded with ice until it is delivered in the family. Milk is a culture-medium for different species of microbes which happen to alight in it. It is believed that the microbes of diphtheria and scarlet fever are propagated in it, and epidemics of these diseases have apparently been traced to the milk employed. How many other pathogenic microbes may be propagated in milk we are unable to state. Milk, therefore, bottled at the farm is safer for use than that served in open cans, especially in the city, the air of which contains numerous species of micro-organisms.

The importance of removing the animal heat from milk in open

¹ *The Med. News*, July 7, 1888.

vessels immediately after the milking by surrounding them with cool running water or ice, and of subsequently maintaining the milk at a low temperature (60° to 65° Fahr.), has been shown by many instances of deleterious results when milkmen have neglected to treat milk in this manner. Upon a hot day in 1886 milk from a mid-day milking from healthy and well-fed cows was transported, in its warm state and in closed cans, a distance of eight miles to Long Branch. In the short time of seven hours, under the influence of animal and atmospheric heat, a poisonous ptomaine, the tyrotoxicou, was developed in the milk, so that the guests of two hotels who partook of the milk in the evening of the same day were poisoned by it, presenting all the symptoms of a choleraic disease. No one can tell how many children have perished from a similar cause—how many cases of fatal cholera infantum have had a similar origin.

Many families are impressed with the belief that milk from one cow is preferable for infant feeding to the mixed milk of the dairy, and they pay a higher price and are sometimes greatly inconvenienced in order to obtain it. Much deception is practised in this matter of obtaining one cow's milk. In New York a female vender of milk said to be from one cow was detected in obtaining her morning supply from the common stock of inferior milk at a corner grocery. But even if the milk be from one cow having the ordinary care and feeding, it is usually more variable than, and does not present so good an average as, the mixed milk from a healthy dairy. The mixed milk is therefore to be preferred.

Our present purpose is to advise in reference to the feeding of newborn babies, but a physician who attends in the parturient state is expected to give advice in reference to the subsequent feeding. If for any reason an infant be deprived of human milk, and be from necessity placed upon cow's milk, the following will be approximately the dilution required at different periods of infancy (the water employed should be boiled in order to destroy any microbes present in it; water which has been distilled is preferable to other kinds): Until the age of three weeks, one part of milk to three of water; from three weeks to six weeks, one part of milk to two parts of water; from six weeks to three months, two parts of milk to three of water; at three months, half milk and half water; at six months and subsequently, three parts of milk and one of water.

In 1881 a conference was held in Salzburg, Germany, of physicians from various parts of the German Empire, known throughout the world as specialists in the diseases of children. The purpose of the convention was to discuss the diet of infancy and childhood. They agreed that animal milk is the best substitute for human milk in the feeding of infants, either as the main food or as the basis of the food employed.

The experience of physicians in all countries shows the soundness of the opinions expressed by the conference, and yet feeding with animal milk of the best quality must be carefully managed or it will be found to disagree with the feeble and readily-disturbed digestive functions of the infant. Employed habitually too hot or too cold, it frequently causes stomatitis or a more serious disease of the digestive organs. It should be given at a uniform temperature of about 99°. Infants under the age of ten months should nurse from the nursing-bottle, and this as soon as used should, with the india-rubber tip and attachment, be immersed in a two-quart bowl of cold water to which two teaspoonfuls of sodium bicarbonate have been added; and this alkaline water should be drawn through the tube and nipple by suction with the mouth.

Cow's milk, though possessing nearly the same composition as human milk, nevertheless behaves differently in some respects in digestion. The casein of human milk coagulates in light floculi in the stomach of the infant, so as to be readily acted on by the digestive ferment, pepsin, while that of cow's milk forms firm and large coagula which are digested with difficulty. A food which is imperfectly digested, and which in part undergoes fermentation, becomes the nidus for the development of many forms of bacteria and ptomaines, which frequently cause gastro-intestinal irritation and catarrh. This condition gives rise to fretfulness, colic, vomiting, diarrhoea, or unhealthy stools and loss of flesh and strength. Cow's milk is digested with difficulty by young infants who have a feeble digestive function. Therefore the profession has long felt the need of some modification of cow's milk, so that it may resemble more closely human milk when acted on by the digestive ferments. This has in a measure been accomplished by the process known as peptonizing, by which the casein is digested, or so far digested that it coagulates in flakes.

At the meeting of the Salzburg conference alluded to above a distinguished physician present recommended the peptonizing of milk for infant feeding, and this process apparently met the approval of the conference. Milk is peptonized by the action on it of extractum pancreatis and sodium bicarbonate. Messrs. Fairchild Bros. & Foster of New York have simplified the process of peptonizing, and prepared the agents used for this purpose, so that the change in the milk can be readily effected in the nursery at the time of each feeding. We may here briefly state the method: A powder containing five grains of extractum pancreatis and fifteen of sodium bicarbonate is put in a clean quart bottle, and a small teacupful of cool water is added and shaken. Then a pint of cool milk is added and the mixture shaken again. The bottle is then placed for twenty minutes in water at such a temperature that the whole hand can be held in it for a minute without discom-

fort. Then the bottle is surrounded with ice to prevent further peptonizing.

By peptonizing is accomplished what physicians have long felt the need of, especially in the feeding of newborn babies whose digestive function is feeble—to wit, a mode of preparing cow's milk so that its casein coagulates in flakes like that of human milk. Milk employed for peptonizing and for the feeding of newborn infants should of course be as fresh as possible, but, unfortunately, much of the milk delivered in the cities is twenty-four hours old when received, and if the weather be hot, instances are not infrequent in which it has begun to undergo fermentation, and is of course unsuitable for infant feeding, whether peptonized or manipulated in any other way. This is one of the chief reasons why in city practice the use of peptonized milk not infrequently disappoints our expectations. The peptonizing of milk rests on a scientific basis, and as clinical experience has demonstrated the usefulness of milk prepared in this manner in the feeding of newborn infants, and in those who are older, as well as invalid adults, it will probably continue to be used as one of the best substitutes for breast milk.

In New York City, from the fact that much of the milk dispensed in families is unsuitable for infant feeding, especially in the warm months, when fermentation begins early, the condensed milks have come into extensive use. The canned condensed milks contain too much cane-sugar (nearly 50 per cent.) for ordinary use in the nursery. The habitual employment of this milk for an infant remaining in the city during the hot months is likely to result disastrously in the production of that fatal disease, the summer diarrhœa, and the newborn are even more liable to it than those who are older. In any season the newborn infant whose food contains 50 per cent. of cane-sugar is very prone to contract sprue, in addition to gastro-intestinal catarrh. Although the canned condensed milk should not be recommended for habitual use for the reason stated, the fresh condensed milk dispensed daily—if, as is true with at least one of the companies, the health, feeding, and milking of the cows, and subsequent management of the milk before and after condensation, are under close surveillance—is free from the objections mentioned. The use of all condensed milks is condemned by certain good observers, but fresh condensed milk prepared by a careful and painstaking company is preferable for infant feeding to ordinary milk, which has been badly managed, and in which we can detect commencing fermentative changes. Such milk is not infrequently dispensed in New York, especially among the poorer families and in the hot months. I could cite instances in which the change from the use of the ordinary milk to condensed milk was very advantageous to infants. For an infant under the age of three weeks one part of condensed milk should be mixed with fifteen parts of boiling water,

and a little salt added. As the child grows older the proportion of milk should be increased. The bad result obtained by physicians in the employment of fresh condensed milk is, in my opinion, largely due to erroneous directions given in reference to its dilution. Even physicians of large experience often give loose and faulty directions. I have many times examined infants suffering from inanition, and been told that one teaspoonful of condensed milk was added to a teacupful of water; and in one recent instance in which a young infant had marasmus the family physician stated that it had been fed with condensed milk, one teaspoonful to a pint of water, by his direction. The patient had scanty stools, but very abundant urination. One who prescribes condensed milk should recollect that it differs from ordinary milk in the fact that about 75 per cent. of its water is removed under vacuum, so that it requires the addition of only three or four times its quantity of water to restore the original proportion of this ingredient.

The newly-born infant usually thrives for a time by the use of cow's milk when of good quality and prepared as recommended by Dr. Meigs or by peptonizing. As long as it agrees with the feeble digestive functions of the infant, milk prepared by either of these processes may be indefinitely employed, either to supplement the wet-nursing when the mother's milk is inadequate, or as the sole food when weaning has been necessary. But in the cities, where the cow's milk dispensed in the morning is from twelve to twenty-four hours old, and especially in the hot months when fermentative changes in the milk occur early, a certain proportion of infants thus fed begin to suffer from indigestion, colicky pains, vomiting, diarrhoea, and stomatitis, and it becomes a very important duty on the part of the physician to suggest such change in the kind of food or in its preparation that it will be more easily digested and be sufficiently nutritious.

Chloride of sodium aids in the digestion, and it should be added to the diet of the infant in sufficient quantity to be slightly tasted. It is believed to stimulate the follicles that secrete the digestive ferments, and it is said also to have a tendency to prevent in a measure the heavy and solid curds of casein which are digested with such difficulty by young infants. Therefore common table-salt is a very important addition to the dietary of the nursery.

We have stated above that whatever food artificially prepared is employed in the feeding of infants, animal milk, and in this country cow's milk, must be its most important ingredient, and measures have been employed to render it more digestible by young infants with a degree of success. The fact has long been known that one of the farinaceous foods, as barley flour mixed with milk, tends by mechanically separating the particles of casein to prevent the formation of hard and firm curds in the stomach. But starch is digested with difficulty

and in small amount by infants under the age of three months. The salivary glands and the pancreas, whose secretions digest starch, are almost rudimentary under the age of three months, and the digestive ferments which they secrete therefore aid but little in the starch-digestion. The oral and intestinal secretions aid a little, but very inadequately, in the transformation of starch. Therefore the cereals which contain from 60 to 70 per cent. of starch are justly considered as improper food for young infants unless the starch is predigested. It was the crowning labor in the life of the late Baron Liebig that he pointed out the way to predigest starch by the action of the diastase of malt. Starch when digested becomes, first, soluble starch, then dextrin, and finally glucose. Dextrin can be digested and assimilated by the youngest infant, and glucose or grape-sugar can be readily assimilated in the first weeks of life in any desirable quantity. Prof. A. Jacobi says: "Grape-sugar and dextrin are absorbed equally."¹

A considerable part of the starch in the various cereals can be changed into dextrin by the prolonged action of heat, and thus a digestible form of barley or other flour can be obtained without any chemical admixture. Impressed with the importance of preparing such a flour for use in the nursery, I have induced a party to prepare and place in certain drug-stores in New York barley flour prepared as follows: The flour, dry in a dish, is suspended over boiling water seven days; it is then grated and sifted, and maintained at a temperature a little above animal heat two days longer. It is then ready for use. It has a reddish-yellow tinge from the large proportion of dextrin present. For an infant in the first month one teaspoonful of the prepared flour should be added to fifteen teaspoonsful of water, brought to a boil, and an equal quantity of peptonized milk be added, or in place of this five teaspoonsful of milk or one teaspoonful of fresh, not canned, condensed milk.

The above are proper modes of feeding newly-born babies when unfortunately deprived of the mother's milk. Many thus fed do well, but no food is so suitable for young infants as human milk when it can be obtained in sufficient quantity and from a healthy source. In addition to the salt which should always be employed in these artificial preparations, a little sugar may also be added. Grape-sugar added so as to sweeten the food will often render it more palatable, and it has a tendency to obviate any constipation which may be present.

In Volume I. p. 535, is a description of the incubator or hatching-cradle employed by M. Tarnier, and through his advice by many other physicians, in the management of weak and immature infants. But the feeding of such infants is a matter of the highest importance, for success in the use of the hatching-cradle depends largely on the alimentation.

¹ *Archives of Pediatrics*, Jan., 1888, p. 8.

The immature infant often swallows with difficulty, and a considerable part of the food placed in its mouth flows out between the lips, and if the nutriment taken be insufficient it loses in flesh and strength. Under these circumstances gavage is employed. The infant is taken upon the lap with the head slightly raised; an urethral red-rubber catheter (No. 14-16, French), moistened, is introduced to the base of the tongue, and by the efforts of deglutition is carried down the œsophagus to the stomach. A small glass funnel is inserted in the open end, and liquid food placed in it descends into the stomach. The tube is then removed rapidly, for its slow removal is likely to produce vomiting. For small, premature infants about two to three fluidrachms of the mother's milk should in this manner be introduced into the stomach nearly every hour. If her milk cannot be employed, the milk of a wet-nurse or peptonized milk may be used instead. If the amount of nutriment administered in this way be too abundant, the child may increase in weight and size, but it is from œdema, which disappears when the proper amount of nutriment is given. If excessive feeding be continued, indigestion results, followed by gastro-intestinal catarrh, which may be fatal. If the infant gain in strength, it should be applied to the breast as soon as it is able to grasp the nipple, but it is usually best to employ the gavage mode of alimentation three or four times daily (*gavage de renfort* of Tarnier) even when suckling is possible until the infant becomes stronger and can draw the breast milk like infants that are vigorous and born at term. By the use of the hatching-cradle and alimentation by gavage infants born as early as the sixth month have been viable.

Effect of Medicines on the Mother's Milk.—This important subject has been investigated by Fehling.¹ According to him, one to two grammes of salicylate of sodium taken by a woman who is wet-nursing may be recovered in part in the child's urine. Rheumatism in the nursing child may therefore be treated by the ordinary doses of this agent administered to the mother. Rheumatism occurs more frequently in the nursing infant than is commonly supposed, since its symptoms as regards the joints are commonly mild and likely to be overlooked; and it often causes endocarditis and permanent valvular disease. Schaeffer² relates the case of an infant born with rheumatism. Iodide of potassium also, says Fehling, given to the mother may be detected in large quantity in the infant's urine. Fehling has made the following observations: Ferrocyanide of potassium is eliminated in the mother's urine, but not in the child's. Its quantity in the milk of the mother is very small. After applying iodoform to perineal lacerations, iodine was found in the milk and urine of the mother, and some-

¹ *Arch. f. Gyn.*, xxvii. p. 332; *Journ. de Méd.*, July 31, 1887.

² *Berliner klinische Woch.*, No. 5, 1886; *Revue Mens.*, Apr., 1886.

times, but not always, in the infant's urine. No apparent harm to the infant occurred in any instance from applying iodoform to the mother during the period of lactation. When mercury was taken by the mother it did not usually appear in the milk. A solution of citric acid, one part to ninety, given for four days, the quantity not exceeding three grammes, did not produce any perceptible change in the milk. The same was true of the administration of acetic and hydrochloric acids. Fehling concludes from his observations that acid foods, as salads, need not to be withheld from nursing women, at least so far as there is risk of producing the secretion of acid milk. Twenty-five drops of landanum given to the mother in no instance caused drowsiness, constipation, or any other ill effect in the nursing infant. Morphia given hypodermically did not, as a rule, appear to affect the child, but in one or two instances it slept rather long. On the other hand, atropine taken by the mother caused dilatation of the pupils of the child. Chloral hydrate given in as large a quantity as twenty-three to forty-six grains in no instance produced symptoms in the child.

The effect on the nursing child of medicines administered to the mother requires further investigation. The observations relating to it published in the journals are as yet insufficient for the valid and reliable deductions which are required by the profession to ensure safe and proper medication of the mother during lactation.

BATHING.—At birth the external and internal temperature of the infant is about the same, that of the external surface being nearly or quite as high as that of the blood. The temperature of the lying-in apartment being twenty degrees lower, a sudden reduction of the external warmth of the infant occurs unless it be immediately enveloped in a warm blanket at birth. The washing of the infant, which requires exposure, should be performed without unnecessary delay, with water at a temperature of about 94°. It is perhaps better that weakly and premature infants, who react feebly and slowly, be not bathed at all, but their surfaces be rubbed with sweet oil and wiped with a soft cloth. Indeed, it is a question whether sweet oil should not be used in all cases, instead of water, in removing from the surface of the newborn the irritating products of exfoliated epidermis and amniotic secretion. If water be employed, bathing should be expedited, the surface dried as soon as possible, and gently rubbed with a soft towel whenever the temperature of the extremities is below normal and they begin to have a livid color, for there is great danger of catching cold when the surface is chilled by the evaporation of water and does not quickly react.

When the navel is dressed no general bath is required or is proper until the detachment of the cord. During the first year after the fall of the cord the bath should be employed daily, but not longer than

three minutes, during which time thorough ablution can be performed. Authorities disagree in regard to the proper temperature of the bath during the first months of infancy. Steiner of Prague, a high authority in children's diseases, says: "During the first nine months the infant should have a daily bath a little above blood-heat;" but most writers recommend a temperature a little below blood-heat. It should probably be at about 92° , which is considerably below blood-heat, but it communicates a moderately warm sensation to the hand. For vigorous children at the age of six months and subsequently the temperature of the bath may be at 90° , and it should not be lower than this during the remainder of infancy, or if it be a little lower care should be taken to produce reaction by the warmth of the room and brisk rubbing and exercise after a short bath. The rules given in the books, not to bathe a child immediately after a hearty meal or after much exercise when the surface is perspiring, should be heeded. The head should first be wet with the water, and castile soap should be applied over the surface to ensure cleanliness. The strongly scented toilet soaps sometimes contain rancid fats or other deleterious substances, and should be regarded with suspicion. In hot weather a daily bath is advisable, but in the cool months a bath twice a week is sufficient, local sponging being employed between-times to ensure cleanliness.

CLOTHING.—Too little attention is given by physicians to the manner in which young infants are clothed. Many errors are unconsciously committed by parents and nurses in the selection of the garments to be worn and the manner of applying them. An important principle in the clothing of children of any age is to apply the garments so loosely that, while they protect from vicissitudes of temperature and produce the necessary warmth, they do not in the least restrain the functional activity of the organs underneath. Even in the application of the first article of dress, the bellyband, harm is sometimes done, since nurses often apply it too snugly over not only the abdomen, but the lower part of the chest. I have frequently interposed to loosen not only the bellyband, but the external dressing, which was so snugly drawn as not only to compress the stomach and intestines, but also the lower ribs. Tight bandaging of the chest and abdomen is more injurious in early infancy, when the tissues are soft and yielding, than at any other age, since it may seriously impair the functional activity of both the thoracic and abdominal organs. Bandaging too snugly over the epigastric and hypochondriac regions tends to prevent full inflation of the lower lobes of the lungs by restraining the movements of the diaphragm and depressing the ribs, which are very yielding at this age. It no doubt aids in causing pulmonary collapse in cases of severe bronchial catarrh. The stomach requires full expansion and free movement in order to perform its function of digestion properly. Undue pres-

sure upon it causes an uncomfortable sensation, fretfulness, and sometimes regurgitation or vomiting of food. The intestines and solid organs of the abdomen tolerate compression better, but their functions are more or less restrained by it. When the epigastric and abdominal covering is so snug as to cause fretfulness, loss of sleep and forcible crying, inguinal hernia sometimes results—an annoying and painful ailment to the young as well as old.

Another part where too snug an application of the dress does harm is the neck, since undue pressure in this region retards the circulation of blood through important vessels, those which supply blood to or return it from the head. The dress upon the neck should be so loose that the nurse can readily apply the four fingers underneath it. The common practice of covering the head at all times, and burying in a soft pillow even during the midsummer heat, is wrong. While the body and extremities should be warm and protected from vicissitudes of temperature by suitable clothing, the head requires different treatment. The infant is very liable to cerebral congestions, which give rise to headache and fretfulness, and which, according to M. Jules Simon,¹ though at first simply a functional disturbance, may end in serious and fatal organic disease. While, therefore, all undue excitement of the infant should be avoided, its head should be uncovered or loosely covered in the habitually warm air of the nursery. When it is taken outdoors, of course the head should be properly covered, unless during the midsummer heat.

In determining the amount of clothing which would be proper for the newly-born infant we must regard the habitual warmth of the nursery. Its temperature should never be below 70° nor above 75°, but in midsummer it will necessarily on some days be higher. It is the common practice in families to leave off the “bellyband” when the infant has reached the age of three or four months; but from the fact that it so often takes cold, especially at night, by throwing off bed-clothes, both in cool weather when the temperature of the apartment may fall below 70° and in summer when there are currents of air through open windows, I advise the continuance of the band during the first year or even during infancy. It would be well if the accoucheur should recommend this before discontinuing his visits. Bronchitis, broncho-pneumonia, and sometimes, in my opinion, that fatal disease trismus, occasionally occur from the sudden exposure of the unprotected surface of the newly-born infant to cold air or to currents of air.

The bellyband in the summer should be made of light merino and in the winter of flannel, and should be secured by safety-pins or stitches. If excoriations or prickly heat appear on the skin under the band in hot weather—a very common eruption in infancy—the surface

¹ *Trans. of Ninth International Med. Cong.*

should be dusted with lycopodium mixed with an equal quantity of bismuth or oxide of zinc, and a single layer of linen should be applied over it and under the band. If the eruption be severe, it might be best to substitute a linen or soft muslin band for a time in place of the merino.

If the child have reached an age at which it is proper to take it in the open air when the weather is suitable, its head and ears should always be properly protected by covering while it is outdoors. Many a young child with scanty growth of hair has contracted that painful disease inflammation of the ear, to which infants are very liable, followed perhaps by a protracted discharge and more or less impairment of hearing, in consequence of taking cold from insufficient covering of the head and ears in inclement and changeable weather. Even leaving off accidentally for a short time a garment to which the infant is accustomed will sometimes give it a cold.

Clothing protects the body according to its thickness and the feebleness of its conducting power of heat. Woollen, fur, and feather garments have very low conducting power, and wool, from its plentiful supply and cheapness, must always be the material which is chiefly worn in the winter season; while cotton, and in still greater degree linen, are active conductors of heat, allowing its quick escape from any part of the body which it covers, and they are therefore the proper material for summer clothing. The color of a garment matters little as regards the escape of heat from the body, for, whatever its color, its surface next the body is necessarily dark from the exclusion of light; but the color is important as regards the absorption of heat from the atmosphere and solar rays. Black has the highest absorptive powers, while white has the least, and mixed colors have an absorptive power which is intermediate. In experiments made with shirtings of different colors, while white received 100° Fahr., black received 208°. A light color is therefore the best to dress infants in during the heat of midsummer.

The extremities should always be warm and dry, and care should be taken that the garments which cover them should be pliable and loose, like those of the trunk. The younger the infant the greater is the injury from undue compression of any part. The diaper should be examined frequently, and removed as soon as possible whenever soiled. By so doing erythema intertrigo, which always increases the fretfulness of the child, may in great measure be avoided.

SLEEP; EXERCISE.—The newly-born infant requires from fifteen to eighteen hours' sleep each day. It sleeps, therefore, most of the time when not awake for nursing, bathing, or change of clothing. If it do not have this amount of sleep and be wakeful, it is probably not well and requires the advice of the physician. As it grows older, a less and

less amount of sleep is needed. Between the ages of three and six months about fifteen hours of sleep each day suffice, and between the ages of six and ten months twelve hours. If the child be not allowed the proper amount of sleep in the crib or cradle, it is likely to fall asleep on the sofa or floor, or in places where it is liable to take cold from currents of air or scant covering if not heeded.

Much harm has been done to young infants who were wakeful by nurses, and mothers too, who have given them active and dangerous drugs as laudanum or morphine under some enticing name as "soothing syrup" or "cordial." A fretful infant deprived of the needed sleep is not well: its ailment is probably trivial, but it may be grave. It should never, under such circumstances, receive any of those proprietary mixtures having seductive names which the shops contain. If it need medicine, it should be examined and prescribed for by the physician.

It is perhaps unnecessary to state that free ventilation and the utmost purity of the air are requisite in the nursery, so far as they can be obtained without exposure to draughts of air and without the reduction of the temperature below 70°. Overcrowding in the sleeping apartment must be studiously avoided. Curtains should not, as a rule, be employed, and no open vessels containing foul water should stand in the room, or anything that may contaminate the air.

Exercise promotes the general health and bodily development at all periods of life, and when not excessive it should not be restrained. The newly-born infant has its mode of exercise in the movements of its head and limbs and in the vigorous outcries which inflate the lungs and develop the respiratory muscles. Free movements of the limbs should be encouraged even in the youngest infants. In some European countries, in families of the laboring class, who have little knowledge or thought of hygienic requirements, it is the common practice to surround the body and limbs with a pillow reaching from the head to the feet or with two or three thicknesses of coarse, heavy flannel, and prevent the escape of the imprisoned arms and legs by winding over them a strong tape or a cord. The victim of this barbarous practice lies for hours, day after day, unable to move any part except the head. The effect of such treatment and faulty management in other respects is to produce or develop an unhealthy state of the system. Most of the cases of rachitis in the American cities occur in the families which have emigrated from those European countries where the infants are treated in this manner, and who in this country continue the absurd practice. Fortunately, in families of American parentage, even among the poor and ignorant of the tenement-house population, and among the intelligent whatever the nationality, better practices prevail, and the result is a more healthy development of the limbs and bodies of infants.

An infant before he is old enough to stand takes sufficient exercise in a way that is natural and harmless. Let him lie upon his back in the crib or upon the floor, with a blanket under his body and a pillow under his head, with his clothes loose, so as not to restrain the free movements of his limbs. A healthy infant enjoys this liberty, moving all his limbs sufficiently to give them the required exercise, and evincing his delight and the exuberance of his emotions by utterances which are as expressive as words.

In the cool months of our latitude infants should not be taken outdoors until the age of three months, and then only for a brief time in the warmest part of the day ; but in the hot months of summer they should begin to receive outdoor air and exercise at the age of one month. In warm weather the face should not be covered with a veil or otherwise, and air and light should have free access to it. The rays of the sun, however, from a clear sky in the hot months should be excluded by a parasol or the shade of trees or houses, or by the carriage top. In cool weather or when there is wind the protection of a veil is needed. Rude tossing of infants, which is common in families, should always be forbidden. Its effect on the cerebral circulation is likely to be bad, and it involves risk of serious accidents. In one instance to my knowledge death resulted in this way. With the ordinary hired nurse it is safer for the baby to be taken out in a baby-carriage than in the arms, for if the nurse in walking should trip great harm might result. In one instance in my practice convulsions and idiocy were plainly referable to the fall of an infant from its nurse's arms upon its head. The nurse should always be instructed to handle the infant gently. Several instances have come under my observation of paralysis of the arm due to stretching of the brachial plexus, produced by lifting the baby by the arm—a highly censurable practice and one which justifies the dismissal of the nurse. Fortunately, the paralysis is not permanent.

MALFORMATIONS.

The theory that vivid mental impressions experienced by the mother during gestation may arrest or render abnormal the development of the fœtus appears to be fully established by clinical observations. Many cases are on record in which infants were born with marks or deformities corresponding in character with objects which had been seen and had made a strong impression on the maternal mind at an early period in gestation. Facts indicating that the mind of the mother exerts a controlling influence on the development or growth of the fœtus are interesting to the psychologist as well as physician, since they indicate the power and scope of the human mind. That strong emotions may

powerfully affect the functions of most of the important organs in the system is well known. They may derange the liver, causing jaundice; accelerate or for a moment suspend the heart's action; stimulate the kidneys, causing diuresis, or even the intestinal follicles, causing watery evacuations; but with all these organs the brain is connected by nerves which anatomy reveals. On the other hand, the mother and fœtus have a distinct existence as regards their nervous systems, and even their blood. Still, the multitude of facts which have accumulated justify the belief that deformity or arrested development of the fœtus is at times due to the emotions of the mother. Some of the cases related by Dr. Whitehead in his treatise on hereditary diseases are very interesting, and difficult to explain on the ground of coincidence. I have met the following cases: An Irish woman of strong emotions and superstitions was passing along a street in the first months of her gestation, when she was accosted by a beggar, who raised her hand, destitute of thumb and fingers, and in "God's name" asked for alms. The woman passed on, but reflecting in whose name money was asked, felt that she had committed a great sin in refusing assistance. She returned to the place where she had met the beggar, and on different days, but never afterward saw her. Harassed by the thought of her imaginary sin so that for weeks, according to her statement, she was made wretched by it, she approached her confinement. A female infant was born otherwise perfect, but lacking the fingers and thumb of one hand. The deformed limb was on the same side, and it seemed to the mother to resemble precisely, that of the beggar. In another case which I met a very similar malformation was attributed by the mother of the child to an accident occurring to a near relative which necessitated amputation during the time of her gestation. I examined both of these children with defective limbs, and have no doubt of the truthfulness of the parents. In May, 1868, I removed a supernumerary thumb from an infant whose mother, a baker's wife, gave me the following history: No one of the family, and no ancestor, to her knowledge, presented this deformity. In the early months of her gestation she sold bread from the counter, and nearly every day a child with double thumb came in for a penny roll, presenting the penny between the thumb and the finger. After the third month she left the bakery, but the malformation was so impressed upon her mind that she was not surprised to see it reproduced in her infant.

Mrs. S——, West Fiftieth street, New York, when in the seventh week of gestation saw a child with fingers united, so that they resembled the palm of the hand extended. She was much excited at the appearance, and clutched the window-sill with such force as to cause abrasion of the fingers. The malformation of the child made a deep and lasting impression on her mind, and her child, born at term,

had the index, middle, and ring fingers of the left hand webbed and ending with the first phalanges, while the little finger was normal. Mrs. D——, Eighth Avenue, New York, seven months before the birth of her child, when visiting her friends at a distance, accidentally broke the plate of a full set of upper teeth. The fracture was through the centre and antero-posterior. Being away from home, she was much annoyed by the accident, and retained the fragments of the plate *in situ* by pressure with her tongue. As she could not open her mouth without the plate falling out, except it was retained by pressure with the tongue, her mind was dwelling almost constantly on the accident during the few days of her visit. Her boy, born seven months subsequently, had a hare-lip and cleft palate. The mother stated that the deficiency in the lip and palate corresponded precisely with the location of the fracture in the plate.

Dr. Greenley¹ relates five cases in which infants at birth presented marks or arrested development corresponding in appearance with objects which produced strong mental impressions with the mothers.

Dr. W. A. Hammond of New York, in a paper upon the "Influence of the Maternal Mind," etc.² says: "The chances of these instances and others which I have mentioned being due to coincidence are infinitesimally small, and, though I am careful not to reason upon the principle of *post hoc, ergo propter hoc*, I cannot, nor do I think any other person can, no matter how logical may be his mind, reason fairly against the connection of cause and effect in such cases. The correctness of the facts can only be questioned; if these be accepted, the probabilities are thousands of millions to one that the relation between the phenomena is direct." Prof. Dalton also says:³ "There is now little room for doubt that various deformities and deficiencies of the fœtus, conformably to the popular belief, do really originate in certain cases from nervous impressions, such as disgust, fear, or anger, experienced by the mother." The observations on which this belief is based relate both to man and the lower animals. A very strong argument in its support is, as Prof. Hammond remarks, the popular opinion, which dates back to the time of Jacob (Gen. xxx.). An almost universal sentiment, running through centuries, is rarely wholly fallacious. It has some truth for its foundation, especially when, as in this instance, the subject is one of observation.

If maternal emotions affect the development of the exterior of the fœtus, as observations show and physiologists admit, the presumption is strong that they may affect also the proper development and adjustment of the parts of the brain, an organ so complex and delicate, and may therefore give rise to idiocy. Dr. Seguin⁴ thus remarks on this

¹ *Am. Prac. and News*, Oct. 29, 1887.

² *Quarterly Journ. of Psychological Med.*

³ *Human Physiology*.

⁴ *Idiocy and its Treatment, etc.*, N. Y., 1866.

point: "Impressions will sometimes reach the fœtus in its recess, cut off its legs or arms, or inflict large flesh wounds before birth; . . . from which we surmise that idiocy holds unknown though certain relations to maternal impressions as modifications to placental nutrition."

It is an interesting fact that abnormalities of structure, occurring from whatever cause, are likely to be propagated to descendants. Dr. Carpenter and others relate instances among the lower animals, and similar instances of transmission have now and then been observed in the human race. Thus, in the issue of *Nature* for March 7, 1878, it is stated on the authority of M. Lenglen, a physician of Arras, that a certain M. Gamelon in the last century had two thumbs on each hand and two great toes on each foot; this peculiarity did not appear in the son, but it reappeared in the three succeeding generations, so that some of the great-great-grandchildren possessed it in as marked a degree as their ancestors.

In view of such important facts the duty of the pregnant woman is rendered the more imperative to avoid the presence of disagreeable and unsightly objects, as well as all causes of excitement, and to remove as soon as possible vivid and unpleasant impressions by quiet diversion of the mind.

Malformations are numerous not only of internal organs, but of external and visible parts. We will only describe such as are of special interest to the accoucheur. Most malformations demand the attention of the surgeon rather than of the accoucheur.

ACRANIA.—In this malformation the bones and integuments forming the cranial arch are absent. In extreme cases the cranial arch, part of the neck, the brain, and the medulla oblongata are lacking. A vascular mass lies on the exposed base of the skull, often resembling the placenta in appearance. It consists of connective tissue in addition to the vessels. It is the representative of the cerebral meninges, and is continuous below with the spinal meninges. Its smooth surface is the analogue of the arachnoid. The sensation which is imparted to the finger of the accoucheur pressed upon it is very similar to that produced by a placenta. In some specimens small portions of cerebral matter are found among the vessels of this tumor, but they are so disconnected and isolated that they do not perform in any way the functions of a brain. Occasionally the vascular tumor is absent and the medulla—or, if this be absent, the upper extremity of the spine—is exposed.

The absence of the brain and cranial arch gives a remarkable appearance. The frontal, parietal, and occipital bones are absent, except those portions which are near the base of the cranium. These portions are very thick and closely united, as if there were the usual

amount of osseous substance, but instead of expanding into the arch it had collected in an irregular mass at the base of the cranium. The eyes are prominent, the neck thick and short, while the body and limbs are ordinarily well developed. The physiognomy has a frog-like appearance. Those portions of the cranial nerves which lie without the cranium are well developed, although the intracranial portions are absent. In this anomaly of acrania and anencephalus a twin is often present which in some manner has interfered with the normal development of the fœtus.

FIG. 134.



Symptoms.—If the medulla be absent, of course viability is impossible. If it be present, respiration may occur for a time, but is irregular. The monster may be made to cry, but the cry is a reflex phenomenon resembling a sob or hiccough. It may nurse, its digestive function is well performed, and regular urinary and fecal evacuations occur. There is a tendency in such monsters to convulsions. Blowing upon them and pressure upon the projecting medulla, if this be present, frequently produce this result.

Prognosis.—Fortunately, non-viability or speedy death is the result. If the medulla be present and respiration and circulation be established, nevertheless death usually results within two or three days, and with scarcely an exception within ten days. Convulsions sooner or later supervene, ending in fatal coma.

INCOMPLETE BRAIN.—Deficiencies occur in the formation of the brain, so that there are various grades of incompleteness between the normal and absent brain. Portions of the brain may be absent or rudimentary, while the remainder of the organ has its normal development. The deficiencies are usually in the cerebral hemispheres, while the base of the brain, which is important for the maintenance of life, is perfect. Both hemispheres may be absent, or one absent while the other is complete or small and rudimentary. Incompleteness of the brain may be manifested by the small size of the cranium and the retreating forehead, but occasionally the cranium has its normal shape and size, on account of an increase in the cerebro-spinal fluid proportionate to the deficiency in the cerebral development. Such a case was under observation in the Nursery and Child's Hospital in 1862. She took the breast and received food when placed in her mouth, but without apparent relish. She was supposed for a time to be blind, as she was apparently unconscious of objects around her. There was a total absence of intellectual manifestations. The size and shape of the

head did not differ materially from the normal, but the frontal bone lay a little lower than the parietal. She died of entero-colitis at the age of ten months, and at the autopsy a sac containing about three-fourths of a pint of nearly transparent cerebro-spinal liquid occupied the site of the cerebral hemispheres. Rudimentary hemispheres were found constituting a part of the walls of the sac. The weight of the brain after being a few days in dilute alcohol was $6\frac{1}{2}$ ounces. In this case the fluid was nearly sufficient to compensate for the lack of brain-substance.

Symptoms.—Since in cases of imperfect brain in which life is preserved the arrest of development is usually in the cerebral hemispheres, the symptoms which indicate the deficiency relate chiefly to the degree of mental endowment. If the hemispheres are partially developed, there is a degree of intelligence proportionate to the amount of the cerebral substance present. If the arrest of development be on one side, there may be no appreciable lack of intelligence or mental activity, since one hemisphere may perform the functions of both.

Prognosis.—This as regards life depends on the seat of the arrested development. If the cerebral hemispheres be deficient, the child may live and thrive, though idiotic; but if the arrest of development be at the base of the brain, which controls the functions of animal life and gives origin to nerves which are essential to the physical well-being, life is uncertain and probably will be short. It is evident that therapeutic measures cannot remedy a congenital deficiency in the brain, but the patient philanthropic teacher can impart some instruction to the idiotic, and occasionally improve in a measure their lamentable condition.

MENINGOCELE, ENCEPHALOCELE, HYDRENCÉPHALOCELE.

This is the analogue of spina bifida. An opening exists at some point in the skull, through which the meninges, or meninges with brain-substance, protrude. The deficiency is congenital, and the tumor exists at birth or is noticed soon after. It is termed a meningocele if only meninges protrude; an encephalocele if it contain brain-substance in addition to the meninges; and a hydrencephalocele if, in addition to the brain-substance, the mass contain liquid in its interior.

The most frequent site of these tumors is the occiput, where the protrusion occurs from an opening in or at the edge of the occipital bone. The next most frequent location is the naso-frontal region. Rarely they occur upon the temporal, parietal, and basilar portions of the skull. Ordinarily, the opening in the occipital bone through which the protrusion takes place is at the median line, or near it, anterior or pos-

terior to the occipital protuberance. The opening, if in the anterior part of the occipital bone, may extend to the fontanelle; if in the posterior part, it may extend to the foramen magnum. It may connect posteriorly through the foramen magnum with the cleft of a spina bifida. If the opening in the occipital bone be large, the tumor is also usually large. Prescott Hewitt cites a case in which it extended to the loins; but so large a mass consists mostly of liquid and is rare. An occipital encephalocele contains brain-substance from the cerebellum or posterior cerebral lobes or from both. If the tumor upon the occiput be a hydrencephalocele, the liquid is from the posterior cornu of a distended lateral ventricle or from a distended and dropsical fourth ventricle, and it occupies the interior of the tumor, the brain-substance surrounding it.

FIG. 135.



If the tumor be in the frontal region, the protrusion usually occurs between the cribriform plate of the ethmoid bone and the frontal bone, and it appears externally between the nasal and the frontal bones. Exceptionally, the point of protrusion is between the lateral halves of the frontal bone. The anterior lobe or lobes of the cerebrum protrude in an encephalocele in this location; if the tumor be a hydrencephalocele, the liquid is derived from the anterior cornua of the lateral ventricles. As a rule the frontal are smaller than the occipital tumors, and the skin covering them is more frequently red and vascular, so as to present the appearance of vascular tumors.

Exceptionally, the protrusion occurs from a fontanelle, or from the line of one of the sutures, so that it is seated upon the side of the skull. Cases are also on record in which the opening existed between the ethmoid and sphenoid bones, through the sphenoid, or between the sphenoid and its greater wing. Tumors in this location appear in the pharynx or mouth, or enter an orbit displacing the eye, or protrude through the speno-maxillary fissure. The tumor, having this site, is

usually an encephalocele or hydrancephalocele, the meningocele being rare. Its walls consist of skin, dura mater, and arachnoid, with intervening connective tissue. If the protrusion be at the base of the brain, of course the external covering of skin is lacking. In other locations the skin constitutes the external coat, and it may be tense and scantily covered with hair, or red and vascular. The interior of the sac is lined by the arachnoid and dura mater. These tumors, whatever the exact character of their interior, can be more or less reduced by compression, with a return of a part of their contents into the cranial cavity; but such compression usually produces cerebral symptoms, as stupor or fretfulness, vomiting, and strabismus. The following characteristics of the three forms of these tumors aid in their differential diagnosis:

Meningocele.—Small at first, and remaining either small or of moderate size, fluctuation distinct, pedunculated, translucent, no pulsation, tense on forced expiration, reducible.

Encephalocele.—Small, base wide, no fluctuation, opaque, or sometimes translucent at the apex, distinct pulsation, enlargement by forced expiration, partly reducible, cerebral symptoms occurring from compression.

Hydrancephalocele.—Tumor usually large, often pendulous, and its surface lobulated, pedunculated, fluctuating; portions translucent; pulsation absent or rare. It is seldom affected by pressure, and the patient is likely to be microcephalic from the escape of brain-substance external to the cranium.

These protrusions have been mistaken for various cysts, as cephalæmatoma, serous and sebaceous cysts, abscesses, vascular growths, and polypi. The fact that such errors in diagnosis have been made by various surgeons shows the importance of a thorough and careful examination before operative measures are employed.

Most patients with this deformity die in a few weeks or months. The prognosis depends on the size of the aperture and the amount of protrusion. It is most unfavorable in hydrancephalocele, which is usually attended by deficiency of brain within the cranium, sometimes to such an extent that the patient is microcephalic and early death unavoidable. The hydrancephalic tumor is very liable to grow, and, after a time, rupture, causing immediate death in convulsions or collapse. In meningocele, if the aperture be small, the tumor may remain small, become isolated from the cranial cavity, and the patient may live for years. But of the three forms of the tumor, encephalocele is regarded as the most favorable, since it is usually small, and patients with it not infrequently live many years. The prognosis in these tumors is very similar to that in spina bifida, which varies according to size of the aperture and the amount and character of the protrusion.

Treatment.—Those who have had experience with these tumors concur for the most part in the opinion that surgical interference should not be resorted to unless rupture be imminent. The mass should be protected from abrasion, and that degree of pressure should be employed which can be tolerated without producing cerebral symptoms. It is proper to draw off the liquid of a meningocele if it be distended and likely to rupture, and the tapping may be repeated, with exceptionally the result of a cure or of rendering the tumor stationary. Mr. Holmes has injected the tumor with two drachms of a mixture consisting of one part of tincture of iodine and two of water, allowing it to remain; and Mr. Annandale has ligatured the mass in one instance, and effected a cure. In encephalocele and hydroneurocele support and moderate pressure should be employed, and in the latter some of the liquid should be removed by a small trocar if rupture be threatening.

SPINA BIFIDA.

This is one of the most common of the malformations. In its severe form it is from its nature incurable, admitting only of palliative treatment, while in its milder forms it may be cured or so relieved that it does not endanger life. The term spina bifida is applied to a hernia of the spinal meninges, which produces a rounded tumor, situated posteriorly over the spine in the median line. It is due to the congenital absence or incompleteness of one or more of the arches of the vertebra. In exceptional instances the arch is said to be complete at birth; but the lateral portions separate and are pressed outward during the first weeks of life. The tumor contains cerebro-spinal fluid, and unless it be small, and its walls unusually thick, fluctuation may be detected in it. When the child cries the tumor enlarges, and it is reduced by compression, the fluid re-entering the spinal canal. If the tumor be large, its complete subsidence by pressure often produces dangerous cerebral symptoms. Spina bifida is the counterpart of hydrocephalus, and the two often coexist. If we compress the hydrocephalic head the spinal tumor enlarges, and *vice versa*. Club-foot is another not infrequent complication. In the case which is represented in the accompanying woodcut (Fig. 136), hydrocephalus, spina bifida, and club-foot coexisted. The child was brought to the children's class in the Outdoor Department at Bellevue, and after a few visits I lost sight of it. It probably died soon after, since the tumor, over which the cuticle was wanting, presented a deep red appearance as if inflamed, so that ulceration and escape of the fluid seemed near at hand. There is ordinarily but one spina bifida, the common seat of which is the lumbar region, but occasionally two or more are present. If the aperture through which the tumor protrudes be small, it is usually pedunculated, but if large it is sessile. In some

patients it is covered by skin, which may be normal or somewhat indurated; in others the skin is absent over the entire tumor or its most prominent part, and the dura mater or the connective tissue lying directly over the dura mater is exposed, and is liable to inflammation from friction. If the walls of the tumor be thin, the liquid may transude in

FIG. 136.



drops, and they are liable to give way by ulceration or rupture. Sudden escape of the liquid and collapse of the spina bifida involve great danger, for convulsions, coma, and death are the common result.

The relation of the spinal cord or nerves, or of the cauda equina, to the tumor is a matter of great importance. In many patients the adjacent portion of the cord or cauda equina is deflected through the aperture, and lies against the interior of the sac. Spinal nerves also not infre-

quently lie within the sac, some returning into the spinal canal, and others passing through the walls of the sac to their points of distribution. Those which are deflected into the tumor and return into the canal obviously lie lowest. In the most favorable cases, to wit, those with a small aperture or small tumor, or a narrow and long peduncle, neither the cord, cauda equina, nor nerves lie within the sac. It is important to the practitioner to bear in mind that in all probability, unless under the favorable anatomical circumstances stated above, the sac contains nervous elements. In rare instances the liquid, instead of lying externally to the cord, lies within its central canal. The substance of the cord then becomes distended, and it encloses the liquid like a delicate sac, just as the hemispheres of the brain are unfolded and expanded in the common form of congenital hydrocephalus. As might be expected from the anatomical characters of the more serious forms of spina bifida, paralysis, more or less complete, of the vesical and rectal muscular fibres, and paraplegia sometimes occur, in which event the fatal issue is probably not far distant.

Diagnosis.—This is easy in ordinary cases. The congenital nature of the tumor and the bony edge of the aperture, appreciable to the touch, suffice in ordinary cases to establish the diagnosis. The diminution of the tumor by pressure, and its enlargement when the child cries, are important diagnostic signs. There are various lumbo-sacral tumors located in the median line from which it is important that spina bifida

should be diagnosticated. Sometimes a cyst occurs in this situation which was originally a spina bifida, but obliteration of the canal in the pedicle occurred, just as the canal connecting a hydrocele with the abdominal cavity closes. Solid congenital tumors sometimes also grow in the same situation, among which, as most common, may be mentioned fatty tumors and tumors containing foetal remains. The most common seat of tumors which enclose foetal remains is at the point where spina bifida ordinarily occurs. Physicians have erred in mistaking these tumors, as well as those which consist of fat, for spina bifida; but a mistake in diagnosis can only occur through haste or carelessness of examination.

Prognosis.—This is in most instances unfavorable. Ordinarily the tumor increases slowly, and finally the sac gives way by ulceration or rupture; the liquid escapes, and death occurs in convulsions and coma; or, if the escape of the liquid be prevented by pressure and the aperture closes, a second rupture is probable, with a fatal result. In other cases the tumor may not rupture, but the cord is softened or it is injured by being bent, so that paraplegia results, and death after a time occurs in a state of emaciation. Rarely the tumor may shrivel by absorption of the liquid, and the disease is cured, or so nearly cured that it gives no inconvenience and the patient lives for years. In other rare instances the tumor may remain without any material change and without giving rise to symptoms. The spina bifida being small and covered with skin, and the aperture leading from it into the spinal canal being also small, the patient lives through the natural period of life with little inconvenience.

Treatment.—It is evident, from what has been stated, that no fixed rule can be laid down for the treatment of the spina bifida. In the most favorable cases, in which no symptoms occur and there is no indication that the tumor will undergo any unfavorable change, surgical treatment is not required, except the application of a soft pad to support the tumor, so as to prevent its injury by friction. Indications which justify active surgical interference are growth of tumor, absence of skin from it, with tension of the parietes, so that an early rupture is inevitable, and the occurrence of dangerous nervous symptoms, as convulsions or paraplegia.

From the nature of spina bifida it is evident that operations upon it must be conducted with caution. The usual presence of the spinal cord in the pedicle and in the sac forbids ligation and excision, and renders hazardous attempts to obliterate the sac by producing inflammation within it. A safe mode of treatment, but not the most efficient, is to puncture the sac and withdraw a portion of the liquid by a grooved needle or hypodermic syringe. A soft pad should then be applied to produce gentle compression. If no unfavorable symptoms occur, the

puncture may be repeated after a day or two. This operation has been employed with a satisfactory result by Sir Astley Cooper among others ; but, simple as it is, it is not devoid of danger, for the removal of the liquid, if carried beyond a certain point, may produce dangerous nervous symptoms, especially convulsions. In performing the operation the puncture should never be made in the median line, on account of the danger of wounding the cord, which lies against the median portion of the sac. The veins, also, should be avoided.

Another mode of treatment is by iodine injections. They are preferable to other methods if the neck be long and pedunculated, so as to be easily compressed. If the tumor be sessile, and the aperture into the spinal canal be free, these injections involve great danger, and are not to be recommended ; for more or less of the solution will inevitably enter the spinal canal, and give rise to spinal meningitis. Iodine injections have been employed with success by Professor Brainard of Chicago, who states that he "perfectly and permanently cured" three of seven cases ; and by Velpeau, of Paris, by whose method five in ten operations were successful, and by many others. Professor Brainard withdrew some of the liquid contents, and then injected half an ounce of water containing $2\frac{1}{2}$ grains of iodine and $7\frac{1}{2}$ grains of iodide of potassium. In a few seconds this was allowed to flow out, and the sac was then washed out with tepid water. Then a portion of the cerebro-spinal fluid, which had been kept warm, was returned into the sac. When he had withdrawn six ounces of this fluid he returned two ounces. In employing the iodine or any other irritating injection, it is necessary to compress the pedicle, so that the liquid does not enter the spinal canal. Velpeau employed one part of iodine, one of iodide of potassium, and ten of distilled water.

During a debate in the Société de Chirurgie, M. Debout recommended the evacuation of only a little of the fluid, and the injection of two or three drops of the tincture of iodine diluted with an equal quantity of water. T. Smith,¹ by the injection of one drop of the tincture, produced an amount of inflammation which nearly obliterated the sac. Since statistics show so good a result of iodine injections, this mode of treatment seems preferable to any other for certain cases, and as one drop has produced general inflammation of the sac and nearly obliterated it, it seems safest and best to begin with so small a quantity.

If there be reason to believe, from the small size of the orifice and other anatomical characters, that neither the cord, cauda equina, nor any of the spinal nerves lie within the sac, it may be thought best to remove the tumor. It has, indeed, been proposed to open the tumor, immersed under warm water, sufficiently to observe the relation of the nervous elements, and to press them back gently into the canal if they lie within

¹ *Holmes's Surg. Dis. of Children.*

the sac. If it be decided to remove the spina bifida, a clamp or elastic band is placed around the pedicle so snugly as to cause firm adhesion of the walls of the pedicle, and excite sufficient inflammation in them to produce agglutination, but without causing strangulation or supuration.

After a time, perhaps two or three days, when it is evident that agglutination has occurred from the fact that the liquid cannot be returned within the spinal canal by compressing the sac, the tumor may be removed by the knife or *écraseur*. Statistics do not show so favorable a result of this operation as of the iodine treatment, and the reason is obvious, for it is only in exceptional cases that the tumor can be removed without injury to the nervous tissue, and incision of a portion of the cord or of important nerves either produces death or a condition to which death would be a relief.

Spina bifida has also been treated by opening the sac on its side, pressing back the spinal cord or its nerves into the spinal canal, uniting the edges of the wound, and then applying pressure to prevent protrusion, but the result has not been favorable. Treatment by simple puncture, followed by compression, and if it fail, as it probably will, the cautious use of iodine injections, is the preferable mode of treating ordinary cases of spina bifida which require surgical interference.

CONGENITAL ABNORMALITIES IN THE CIRCULATORY SYSTEM.

Rarely the position of the heart is abnormal, and the most common malposition is its location on the right side of the chest (*dextro-cardia*). This occurs with or without misplacement of other organs. In cases of *dextro-cardia* the liver usually, says Niemeyer, occupies the left hypochondrium, and the spleen the right. In this misplacement of the heart the aorta ordinarily crosses the right bronchus and passes along the right side of the vertebræ, but occasionally it crosses the spine and lies in its usual position on the left side of the vertebræ. The heart in this malposition is sometimes imperfect and sometimes well-formed. In *mesocardia* the heart is situated nearer the median line than usual, corresponding in this respect with the position which it occupies in the first months of fetal life. A rare malposition is the location of the heart outside of the thoracic cavity (*ectocardia extra-thoracica*)—a condition accompanied by, and perhaps due to, deficiency in the sternum or sternum and ribs. In other instances equally rare a part of the diaphragm has been deficient, and the heart has lain in the abdomen; and in other instances still it has been located at the base of the neck. Breschet and others have cited examples of these various forms of *ectopia cordis*.

Symptoms—Prognosis.—If the heart be well formed and complete,

its abnormal position within the thorax may not give rise to symptoms, and is not incompatible with prolonged life. If it be located without the thoracic cavity or be within the cavity and be defective, early death is probable.

PERICARDIUM.—An incomplete pericardium was described by Dr. Baillie in 1878, and since by other observers, among whom Peacock may be mentioned. The pericardium, instead of being normally developed, is represented by a fold or pocket lying over the right side or superior part of the heart. Individuals with this defect may live to middle age or even old age.

MALFORMATIONS OF THE HEART.—Malformation of the heart occurs—1st, from arrested development early in foetal life, so that the organ remains rudimentary; 2d, from arrested development at a more advanced stage, when the cavities, septa, and vessels, though incomplete, are partially formed; 3d, from malposition of the parts of the heart or of the vessels in immediate relation with the heart. The cause of malformation in the heart and the vessels pertaining to it is obscure. It is supposed sometimes to be a myocarditis or endocarditis, which causes the arrest of growth or abnormal development.

Perhaps strong mental excitement sometimes has a causal relation, whatever may be its *modus operandi*, just as it causes external malformations. In a case related by Dr. Peacock¹ the mother stated that when pregnant she was greatly frightened by the appearance of a man who was dying of asthma. In another instance the only assignable cause was fright of the mother at seeing a child killed, and she did not recover from the shock;² in another case the mother was greatly alarmed at the fifth month of gestation,³ and in the fourth instance the mother four or five months before her confinement was greatly frightened by her husband, who was insane, standing over her two hours with a loaded pistol.⁴ But these are exceptional instances. In a large majority of cases of malformation of the heart inquiry fails to elicit any unusual mental excitement of the mothers during their gestation.

Occasionally the malformation appears to be due to some vice or taint in the system of one or both parents. Thus in a case quoted in the *Gazette médicale* for Dec. 28, 1850, the mother, who had rachitis in early life, lost five children soon after their birth, all of whom had lividity as the most prominent symptom. Persistent lividity in the newly-born indicates, almost without exception, malformation at the centre of circulation. In the history of a case which was communicated to Cooper by Farre, “vices of conformation of the heart appeared to have been inherent in the family. Of 12 infants only 4 survived,”

¹ *Malformations of the Heart*, p. 57.

³ *Ibid.*, p. 41.

² *Ibid.*, p. 37.

⁴ *Ibid.*, p. 43.

the death of the 8 being apparently from cardiac malformation. A patient treated by Mr. Leonard was the sixth who had died at about the same age with symptoms of cyanosis. Ordinarily, however, infants who have cardiac malformations, as indicated by the cyanotic hue, belong to healthy families; neither parents, brothers, nor sisters exhibit any taint of system which could sustain a causal relation to any form of malformation.

The opinion is expressed by Gintrac that the number affected with cardiac malformation, as indicated by cyanosis, to the entire population varies in different countries. It is probable that its occurrence is not greatly, if at all, affected by the nationality, but it is certainly dependent to a considerable extent on the condition of society. It appears from statistics to be less frequent in a community in comfortable circumstances and engaged in quiet and wholesome occupations, than in one whose occupations produce undue mental excitement and worryment and irregularities in the mode of life. Pure air and out-door exercise, plain, nutritious diet, freedom from cares and anxieties—in fine, causes which promote the physical well-being—diminish the liability to a malformed and cyanotic offspring; and on the other hand, impure air, improper and insufficient diet, grief, etc. increase the percentage of cardiac malformations and cyanosis. Hence the blue disease is rare in the rural districts and comparatively frequent in the cities, especially in a large city like New York, which contains a numerous indigent and careworn population, living from year to year in the midst of agencies which operate stealthily but certainly to enervate the system and undermine the health.

These remarks are abundantly substantiated by statistics. In New York City, during the period of six years, 1 death resulted from cyanosis to 436 deaths from all causes, and in Brooklyn the proportion estimated for two years was about the same. On the other hand, in the State of Kentucky, which contains few large cities, there was, during a period of five years, 1 death from malformation of the heart to 2469 from all causes. In the State of South Carolina, for three years, 1 death resulted from cyanosis to 5018 from all causes. In the State of Massachusetts, for two years, there was 1 death from cyanosis to 1136 from all causes, and two-thirds of the cyanotic cases occurred in the counties of Suffolk, Essex, and Worcester, which contain large cities. In London 1 death occurred from cyanosis to 755 from all causes during a period of three years. On the other hand, in England, including the city of London, there was, for the ten years ending with 1857, 1 death from cyanosis to 1589 from all causes; and in the rural districts of Monmouth and Wales, only 1 death occurred from cyanosis to 5578 deaths from all causes during a period of two years.

Malformations of the heart derive their seriousness and importance from the fact that the heart is the central organ of circulation, so that when from malformation it is inadequate to perform fully its function, not only is the nutrition seriously interfered with, but the flow of blood through the lungs is insufficient. The blood is not properly oxygenated or depurated, and it is overcharged with carbonic acid, which imparts to it the deeply venous or livid color. Cyanosis, therefore, as indicative of an imperfect heart, a persistent defect in the circulation, and a permanently abnormal state of the blood, is an important disease.

CYANOSIS.—Cyanosis should be placed in the same category with other profound blood dyscrasias. As stated above, when occurring in young infants, the cause is at the centre of circulation, and is a malformation with very few exceptions. The diagnosis can be made with certainty if there have been no symptoms indicating an antecedent disease. In rare instances in infants above the age of five or six months lividity of the surface occurs from *disease* in the lungs, such as extensive emphysema, a pleuritic exudation compressing both lungs, caries of the vertebræ, with consequent depression of the ribs so as to prevent proper inflation of the lungs. But such causes do not exist or are very rare in the neonati.

The blue disease, being so manifest, attracted attention at an early age. It appears from the remarks of Boerhaave that the common people believed that the cyanotic were possessed by evil spirits.¹ It was evidently impossible to understand its cause and nature prior to the discovery of Harvey in the seventeenth century, and most of the exact or scientific knowledge possessed by the profession in reference to the etiology and nature of cyanosis has been achieved since the present century commenced. Boerhaave and Vieussens had observed cases and propounded theories in reference to it, but the knowledge of physicians concerning it remained vague and indefinite. No better idea can be given of the prevailing ignorance in reference to cyanosis, even after the present century commenced, than by quoting from a case related by Ribes in 1814.² The patient had some time previously received an injury of the finger. "Many physicians of Amsterdam," says he, "were at different times consulted on the subject of this affection, no one of whom understood its true cause, its essential character. One considered it as partaking of the nature of epilepsy, and caused by the irritation in the nervous system which the wound in the finger had produced. Others attributed it to the presence of intestinal worms. Some physicians pronounced it an injury to the liver or spleen. Many held it to be a scorbutic affection. One only believed it to be the result of an unknown organic disease." In the present century

¹ *Diseases of the Humors.*

² *Bull. de la Fac. de Méd., 1815.*

numerous carefully-observed cases of cyanosis published in the medical journals, and the writings of Seiler, Louis, Bouillaud, Farre, Chevers, Peacock, Marston, Stillé, and others, have contributed to a better understanding of the nature and anatomical characters of cyanosis.

Sex.—Whatever may be the explanation, the following statistics show an excess of male infants affected with cyanosis:

TABLE 1.

180 cases collated by Aberle	two-thirds males.
44 " " " Gintrac	28 males, 16 females.
41 " " " Stillé	31 " 10 "
134 " " " J. Lewis Smith . 78 " 56 "	

TABLE 2.

Deaths from Cyanosis.

	Males.	Females.
In London, England, in two years	418	273
In New York City, in five years	117	90

Time of Commencement.—It is an interesting and somewhat remarkable fact that cyanosis, though dependent on a malformation, does not always commence at birth, or at least does not exist in degree sufficient to produce the cyanotic hue till some time has elapsed after birth. In 138 of the cases of cyanosis which I have collected the time at which lividity was first observed is stated as follows: In 97 it was within the first week, and generally within a few hours of birth. In the remaining 41 cases it commenced as follows:

In 3 at 2 weeks.	In 6 from 2 years to 5 years.
" 1 " 3 "	" 1 " 5 " " 10 "
" 2 " 1 month.	" 6 " 10 " " 20 "
" 7 from 1 to 2 months.	" 1 " 20 " " 40 "
" 5 " 2 " 6 "	" 1 over 40 years.
" 5 " 6 " 12 "	41, total.
" 3 " 1 year to 2 years.	

In these 41 cases, in which blueness did not occur till after the age of one week, if the patient were less than two years old when it commenced there was frequently no obvious exciting cause, but above this age, with three exceptions, such a cause is known to have been present. It is interesting to observe how trivial the exciting cause frequently is, and equally interesting to note how long patients have enjoyed good health, not having the least lividity, although the anatomical vice to which the final development of cyanosis was due had existed from birth.

Dr. Theophilus Thompson relates¹ the history of a lady, thirty-eight

¹ *Medico-Chir. Trans.*, vol. xxv.

years old, who was well till an attack of Asiatic cholera, after which her health was permanently impaired. Two years before her death she passed through a course of fever, and from this time was cyanotic. In the *Philadelphia Medical Examiner*, June, 1850, Dr. Waters relates a case in which cyanosis began at the age of six years in an attack of measles. In a case published by Mr. Napper in the *London Medical Gazette*, 1841, the child fell at the age of six months, and from this time had cyanosis. A female whose history is given by Prof. Tommasini of Bologna, and quoted by Bouillaud, became cyanotic at the age of twenty-five in consequence of difficult parturition. In the *London Lancet*, 1842, Mr. Stedman relates a case, in which cyanosis began at the age of ten weeks in an attack of convulsions. In the *American Journal of Medical Sciences*, in 1847, Dr. John P. Harrison published the history of a baker, twenty years old, in whom cyanosis began five years previously after great effort in carrying wood. Louis and Bouillaud quote from M. Caillot the case of a child who became cyanotic at the age of two months in an attack of whooping cough. Louis also narrates a case in which whooping cough had the same effect at the age of twelve years. Ribes treated a child in whom the blue disease began at the age of three years from a severe contusion of the fingers. In a case related by Marx it commenced at the age of ten months from a blow on the back inflicted by the mother. In the *Medical Times and Gazette*, for 1855, Mr. Speer gives the history of a female who at the age of thirteen years was put in a place requiring considerable exertion, and from this time was cyanotic. A patient whose case was related by Cherrier fell into a deep ditch in the winter season, and immediately after had a low fever, from which the blue disease commenced. In a case published by Taccorns the exciting cause was believed to be fright in consequence of a fall from a great height, and in another, related by Bouillaud, it was a blow received on the epigastrium after the patient had passed the age of fifty years. Similar cases are related by Mayo and Peacock.

It will be seen that the exciting cause of cyanosis is usually such as produces a profound impression on the system and affects the action of the heart. Precisely in what way it operates to develop the disease has not been satisfactorily explained. Mr. Mayo conjectures that in the case related by him there was previously some compensation which ceased or became inadequate in consequence of some change produced in the economy. Although cyanosis may not appear for months or even years, there is rarely improvement when it is once established. Appearances of amendment are deceptive. The disease when not stationary is progressive, and this explains the fact that few survive the middle period of life.

Symptoms.—The symptoms in cyanosis vary in intensity in different

patients, and in the same patient at different times, being milder if he be quiet and the mind calm, more severe if active or if the mind be agitated. In mild cases, in a state of rest, they nearly or quite disappear, so that a stranger would not suspect that there was any serious ailment. They are aggravated by any cause which accelerates the action of the heart. In some patients cyanosis is increased by the most trivial disturbing influences, among which may be mentioned nursing, dentition, crying, coughing, and slight emotions of joy, sorrow, or anger. In more than one case it has been perceptibly increased by the stimulus of digestion, the color being deeper after a full meal than before.

The cyanotic hue varies in different individuals from duskiness to a deep purple, almost black, color. It is usually most marked in the visage, especially the palpebræ, cheeks, nose, and lips, in the ears, fingers, and toes, and upon the mucous surfaces. It is sometimes, without any assignable cause, confined to a portion of the body. In a case related by Mr. Steel in the *London Lancet*, 1838, the upper part of the body was livid and œdematous, and the lower part pallid and shrunken, and yet the malformation was of the kind which is commonly present in cyanosis. In the *London Medical Times*, March 8, 1845, copied from the *Gazette médicale*, is the history of a child, six years old, in whom the color was deeper on the right than left side. There had been, however, hemiplegia of this side in infancy, but this had entirely passed off. On the other hand, in a case of rare malformation communicated by Cooper to Farre, in which the upper part of the system was supplied chiefly by arterial and the lower by venous blood, the discoloration was general. In exceptional instances livid maculæ, like those of purpura, have been observed upon the skin.

Those affected with cyanosis have generally at birth been well formed and of the usual size, and in most cases for a considerable period after birth the appetite is good, bowels regular, and the system well nourished. But when cyanosis becomes so severe, as it does sooner or later, that its symptoms are rarely absent, digestion is imperfectly performed and the body becomes either emaciated or stunted and puny. It may be stated, as a rule, that nutrition is in inverse proportion to the gravity of cyanosis. In 33 out of 41 cases in which the condition of the system as regards nutrition was recorded either a short time previously to death or at the autopsy, the body was either considerably emaciated or else diminutive, and those who were well nourished were usually such as had died early or of some intercurrent disease.

In this connection may be mentioned two abnormalities which have been observed in the cyanotic. The chest is often flattened laterally with a projecting sternum, so as to present an appearance generally described in the records as "pigeon-breasted." Sometimes the most

prominent part is directly over the heart, and in one or two cases the sternum was observed to be deflected toward the left. In the majority of the records, however, no mention is made of the external appearance of the chest.

The other abnormality is frequently observed in chronic diseases of the heart and lungs, in which there is sluggish circulation and consequent altered nutrition in the fingers and toes. In 28 of the cases collated by myself it is stated that the tips of the fingers or toes, or both, were bulbous. This hypertrophy, if slight, is likely to be overlooked, and that it was observed and recorded in so many cases renders it probable that it was present in a much larger number. In one case the anatomical character of this enlargement was examined, and was found to consist chiefly of hypertrophied connective tissue.

The nails are often incurvated over the deformity. At a meeting of the London Pathological Society in 1859, Mr. Ogle narrated the history of a laborer, fifty years old, who had swelling, numbness, and lividity of the left arm from pressure of an aneurism, and the fingers on this side were clubbed as in cyanosis. A patient whose history is related in the *Glasgow Medical Journal*, and who was believed to be cyanotic in consequence of a highly emphysematous state of the lungs, had a similar development of the tips of both fingers and toes.

An interesting feature in cyanosis is the low grade of animal heat. The temperature of the body is in all cases below that of health. This is especially noticeable in the extremities. There has not been a sufficient number of accurate thermometric observations to determine whether the internal heat is usually reduced. The following only have been recorded: Mr. Fletcher relates the history of a young man in the *Medico-Chir. Trans.*, vol. xxv., in whom the thermometer placed in the mouth did not stand above 80° Fahr. Hodgson reports the case of a man, twenty-five years old, in whom the thermometer placed under the tongue rose to 100°. Perhaps a more thorough examination might have disclosed an intercurrent malady to cause the fever. In an examination recorded by Nasse the instrument placed in the mouth fell little if at all below the healthy standard; applied to external parts, it stood at about 21° Reau.= 79.2° Fahr.

The lack of heat is the source of great discomfort to a cyanotic patient. In mild weather he requires a fire to keep him warm or an amount of clothing which to others would be uncomfortable, and in cold weather slight exposure strikes him with a chill. Nor can he increase his heat by active exercise, since his infirmity disqualifies him for this.

Although the temperature of the surface is so low, the occurrence of perspiration, sometimes profuse, is mentioned in several of the records.

In severe cases of cyanosis the generative system is imperfectly

developed. In the female menstruation is scanty or delayed, and in the male signs of puberty are feebly manifest. If the disease be so mild that the symptoms are absent when the patient is in a state of repose, these organs attain nearly or quite their normal development. The catamenia have appeared as early as the age of sixteen years, and a cyanotic patient treated by Cherrier had two children, but they both died of serofilous affections.

The action of the heart is necessarily much involved. In mild forms of the disease, if the patient be quiet, this organ may beat with considerable slowness and regularity, but in all cases exercise or excitement which in a state of health would scarcely have any appreciable effect on the pulse embarrasses its movements and produces palpitation. In severe cases palpitation is rarely absent, and the pulse is frequent, feeble, and often intermittent. In a large proportion of patients bruits are produced by the irregular circulation through the heart.

The respiration corresponds with the action of the heart. It is accelerated in proportion to the frequency of the pulse. The suffering in this disease is largely due to paroxysms of palpitation and dyspnoea. These occur sometimes without any apparent exciting cause, and when the patient is quiet, but they are commonly induced by those causes which we have already mentioned as aggravating the symptoms of cyanosis. They come on suddenly, and are attended by increase of lividity, distension of the jugulars, and sometimes of the cutaneous veins, and by a sensation of present suffocation. They last only a few minutes, and are succeeded by great depression of the vital powers. In infants, on account of greater nervous irritability and feeble power of endurance, these paroxysms often end in convulsions, which occasionally are fatal. A cough is sometimes present, but is usually slight.

Pain is not a common symptom. Some of the patients complain occasionally of headache, with or without vertigo, and occasionally also of pain in the chest, but it is uncertain to what extent or whether these symptoms are dependent on the cyanotic disease. The secretions do not appear to be affected, so far as has been ascertained. The same may be said of the intellectual and moral faculties. In a case related by Dr. Cheevers the child was even said to be precocious.¹ The mind is capable of steady application and acquisition, as in health, provided that the emotions are not unduly excited.

The cyanotic are liable to various forms of hemorrhage, but the records show that this liability is greater in youth and adult life than in infancy. In 2 cases blood was vomited, in 1 passed by stool, in 1 it escaped from the gums, in 2 from the mouth, in 8 from the nostrils, and in 16 it was expectorated. Pulmonary phthisis was, however, usually present in these last cases. In the *Western Journal of Medicine* for

¹ *Lond. Med. Gaz.*, vol. xxxviii.

1829 an interesting case is related by Dr. William M. Voris of a girl nine years old in whom hemorrhage occurred under the scalp, producing great tumefaction and nearly closing the eyelids. An incision was made, from which a pint and a half of dark blood escaped, and it was estimated that more than half a gallon was lost during the ensuing two weeks, at the expiration of which time the incision closed. The patient recovered from the hemorrhage, but not from the cyanosis.

Toward the close of life more or less anasarca occasionally occurs, especially around the ankles, sometimes in the eyelids and face, and rarely to a certain extent over the whole body. In certain patients it coexists with effusion in the serous cavities.

It is evident that one who is affected with the severer form of cyanosis is disqualified for the duties of active life. The sports of childhood and the useful labors of mature years require an exertion for which he is physically unfit. He has not the ability even to engage in animated conversation, for he is overcome by emotions, whether of joy or sorrow. He lives almost an idle spectator of the world around him, prevented by his infirmity from engaging in its pursuits.

Intercurrent diseases, especially those of childhood, are badly tolerated, but whooping cough is the one which these patients are especially ill-fitted to endure. Still, they sometimes pass safely not only through whooping cough, but through some of the most dangerous febrile diseases. It is a question of interest, but about which little is known with certainty, whether these intercurrent maladies are influenced by the cyanotic or venous condition of the blood. The symptoms of these maladies are no doubt more alarming, mainly on account of the embarrassed action of the heart, and not on account of the state of the blood; still it is reasonable to suppose that malignant and asthenic diseases are rendered worse by the lack of oxygen and excess of carbonic acid in the circulating fluid.

Probably cyanosis does not furnish immunity from any other disease, although this statement has been made by a high authority. Rokitsansky says: "All forms of cyanosis, or rather all the diseases of the heart, great vessels, and lungs, adapted to produce cyanosis in a greater or less degree, cannot coexist with tuberculosis. Cyanosis affords a complete protection against it, and in this circumstance may be found an explanation of the immunity from tuberculosis which many conditions of the system, apparently very different in their character, afford."¹ This opinion of the distinguished pathologist, notwithstanding his ample opportunities for observation and known accuracy as an observer, is not substantiated by statistics. So far from its being true, the low degree of vitality in cyanosis appears to favor the occurrence of tubercles. I have records of 26 cases of cyanosis in which tuberculosis

¹ *Handb. der Path. Anat.*, Bd. ii.

was also present, in several of which the lungs contained cavities. This is about 13 per cent. of the whole number in my collection—a large proportion, since so many die in early infancy, at which period the tubercular disease seldom occurs. Cyanosis appears also to favor the development of cerebral diseases, especially congestion and coma, as will be seen presently.

Prognosis.—This is unfavorable. Most cyanotic individuals die young. The age which they attain has been made the subject of statistical inquiry by Aberle. He states that in an aggregate of 159 cases, 57, or 35 per cent., died before the end of the first year; 108, or more than two-thirds, died before the age of eleven years; 30 between the ages of eleven and twenty-five years; and of the remaining 21, only 5 lived more than forty-five years.

The age at which death occurred is given in 186 of the cases collected by myself, as follows:

In 17 under the age of 1 week.	In 21 from 5 years to 10 years.
“ 10 from 1 week to 1 month.	“ 41 “ 10 “ “ 20 “
“ 12 “ 1 month to 3 months.	“ 20 “ 20 “ “ 40 “
“ 11 “ 3 “ to 6 “	“ 4 over 40 “
“ 17 “ 6 “ to 12 “	186, total.
“ 12 “ 1 year to 2 years.	
“ 21 “ 2 years to 5 “	

67, then, or more than one-third, died before the close of the first year; 121, or more than three-fifths, before the age of ten years; only 24 survived the age of twenty years, and four the age of forty years. Of course the duration of life depends on the nature and extent of the malformations. Some of these are such as render a speedy death inevitable.

Mode of Death.—The mode of death is reported in 95 cases as follows:

19 died in a paroxysm of dyspnoea.
10 “ suddenly (the exact manner not stated).
14 “ in convulsions (infants).
2 “ of apoplexy.
7 “ from hemorrhage.
6 “ of phthisis (though, as we have seen, 20 others had this disease).
2 “ of exhaustion, without hemorrhage.
10 “ of coma.
2 “ of abscesses in the brain.

One died of each of the following diseases: cerebral irritation, congestion of brain, effusion in the cranial cavity, acute hydrocephalus, paralysis from acute softening of the brain, dysentery, inflammation of heart, syncope, mucus in the air-passages, thoracic inflammation, choleraic diarrhoea, pneumonitis, bronchitis, scarlet fever, croup. 1 died in try-

ing to walk, 1 after a spasmodic cough in pertussis, 1 after a long agony, 1 after an agony of ten or eleven hours; 1 is reported to have died gradually and 3 quietly.

The 10 who are stated to have died suddenly probably died in paroxysms of palpitation and dyspnœa, which are easily excited and of common occurrence in cyanosis. If so, this was the mode of death in 29 cases. Infants with few exceptions, so far as appears from the records, died in convulsions. 19 died of cerebral affections, exclusive of convulsions, and in 13 of these the cause of death was congestion, apoplexy, or coma. The hemorrhage of which 7 died was probably, in most instances, dependent on phthisis, and 6 are said to have died directly of phthisis. We, may then, regard paroxysms of palpitation and dyspnœa, convulsions, congestive affections of the brain, and phthisis as common modes or causes of death in cyanosis.

The malformations of the heart and great vessels which give rise to cyanosis are quite numerous. The following table exhibits their character and relative frequency :

	Cases.
1. Pulmonary artery absent, rudimentary, impervious, or partially obstructed	97
2. Right auriculo-ventricular orifice impervious or contracted	5
3. Orifice of the pulmonary artery and the right auriculo-ventricular aperture impervious or contracted	6
4. Right ventricle divided into two cavities by a supernumerary septum	11
5. One auricle and one ventricle	12
6. Two auricles and one ventricle	4
7. A single auriculo-ventricular opening; interauricular and interventricular septa incomplete	1
8. Mitral orifice closed or contracted	3
9. Aorta absent, rudimentary, impervious or partially obstructed	3
10. Aortic and the left auriculo-ventricular orifices impervious or contracted	1
11. Aorta and pulmonary artery transposed	14
12. The cavæ entering the left auricle	1
13. Pulmonary veins opening into the right auricle or into the cavæ or azygos veins	2
14. Aorta impervious or contracted above its point of union with the ductus arteriosus; pulmonary artery wholly or in part supplying blood to the descending aorta through the ductus arteriosus	2
Total	162

From the above table it appears that in more than one half of the cases of cyanosis the congenital vice which gives rise to it is located in the pulmonary artery. It is located also, in general, in that part of the artery which is nearest the heart. Its character is different in different cases. Sometimes there is an arrested development of this vessel, and in its place we find simply a ligamentous cord extending from the heart as far as the ductus arteriosus, while beyond this point the artery and its branches are pervious; rarely the entire artery is ligamentous, and of course impervious; in other cases this vessel is

open through its whole extent, but the part nearest the heart is so small as to be properly considered rudimentary ; in others still there is adhesion of the valves to each other as the chief congenital defect ; and finally, in rare instances the obstruction in the pulmonary artery is due to an adventitious membrane which stretches across the vessel like a diaphragm. These last malformations—namely, adhesion of the valves and the formation of an adventitious membrane—are doubtless due to inflammation occurring in the artery before birth, and some attribute the arrested development and ligamentous state of the vessel to the same cause.

In most cases of cyanosis due to obstructive malformations the interauricular and interventricular septa are more or less deficient. This deficiency obviously results from the obstruction, for the septa are formed in the heart after fœtal circulation is established, and the blood, being prevented by the vicious formation from flowing in its proper channel, necessarily passes to the opposite side of the heart. More or less blood being forced from one auricle or one ventricle to the opposite cavity, it is evident that a permanent aperture must result in the septum. The aperture in the septum ventriculorum is ordinarily at its base ; in the septum auriculorum it corresponds with the foramen ovale.

In most of the obstructive malformations one, and rarely two, abnormal cardiac murmurs have been observed. The single murmur accompanies the ventricular contraction. As it has been observed in cases of complete as well as incomplete obstruction, it seems to be due mainly to the flow of blood through a narrow or constricted pulmonary artery or the apertures in the septa.

Modes of Compensation.—In most cases of cyanosis the congenital defect is partially obviated by modes of compensation. In the most frequent malformation, that in which there is obstruction in the pulmonary artery and a considerable part if not all the blood flows directly from the right to the left side of the heart, the ductus arteriosus not only remains open, but is greatly enlarged, through which a current of blood enters the pulmonary artery from the aorta, and, passing to the lungs, is oxygenated. The bronchial arteries have also been found greatly enlarged, and it is believed that though they are the nutrient arteries of the lungs, the blood which they convey to these organs is decarbonized in its circuit through them. In a case published by Mr. Le Gros Clark in the *Medico-Chir. Trans.*, vol. xxx., the bronchial arteries were not only enlarged, but a “ branch from the internal mammary artery, which accompanied the phrenic nerve, was nearly equal in size to the parent trunk, and expended itself principally in the adjacent adherent lung. Branches of the intercostal arteries have also been found enlarged, and entering the lungs or connecting with vessels

which enter the lungs. By such modes of compensation cyanosis is rendered milder and life is prolonged. To these we must attribute the fact that some have very considerable malformation, and yet do not become cyanotic.

Morbid Anatomy.—This, as regards the circulatory system, has been sufficiently dwelt upon. No chemical analysis, so far as I am aware, has yet been made of cyanotic blood. We know that it is dark, its coagulability feeble—that it contains an excess of carbonic acid, and is deficient in oxygen. From the nature of cyanosis it would be inferred that in many cases there is a degree of passive congestion in the cavities of the heart, and consequently in the capillaries of the systemic system, giving rise to more or less serous effusion. Statistics show that this is so. The quantity of pericardial fluid is in some patients increased. I have records relating to this fluid in 51 cases. Usually it was pure serum. In 17 the quantity was half an ounce or less, if we include in the number those in which the amount is expressed in such terms as “due quantity,” “usual amount,” and “small amount.” In 24 cases the pericardial fluid (serum) exceeded half an ounce, usually estimated at from 1 to 6 ounces, but in 2 it exceeded the latter quantity. In 1 of the 24 this fluid was stained with blood. In 2 patients the records state that there was a small quantity of pure blood in the pericardium, and in 1 the two pericardial surfaces were agglutinated by inflammation.

In some of the autopsies serum was found in the pleural cavities, usually in connection with pericardial effusion, and in at least one instance this fluid was tinged with blood. Old adhesions between the costal and pulmonary pleura were observed in a few cases. The condition of the lungs was recorded with more or less minuteness in 110 cases. Mention has already been made of the large number afflicted with tubercular disease, which was either confined to the lungs or was chiefly exhibited in these organs. In 35 patients the records state that the lungs were of small size, either by compression or sometimes, apparently, from the continuance of the foetal state over a greater or less portion of the organ. The compression was produced either by the distended pericardium or by effusion in the pleural cavities. In 35 cases the lungs presented a dark color. This line in some specimens accompanied the unexpanded or foetal state of the organ, but in others there was the normal inflation, and the dark color was due to engorgement or congestion. In other cases the lungs are stated to have been natural except the color. In 9 emphysema was present in a part of the lungs, in 2 pneumonitis; in 2 the color of the lungs was pale, in 1 a bright crimson; in 1 the lungs were larger than natural, in 1 the right lung was absent, and in 17 these organs were recorded healthy.

I have records of the state of the liver in 26 cases, in 16 of which

it was enlarged, and in 4 of these it was congested. Congestion of the liver was present in 8 other cases in which no mention is made of its volume. The parenchyma of this organ had a natural appearance in 9 cases, but in some of these there was enlargement. From these statistics it is probable that the liver is commonly enlarged in cyanosis, and not infrequently congested. In a few cases the condition of the other abdominal viscera is mentioned—in some as healthy, in others as congested. Fifteen examinations of the brain were made, in 7 of which congestion is recorded, and in 3 abscesses in the cerebral substance, in 1 of which cases the lateral ventricle was also filled with pus; in 2 softening of a portion of the brain had occurred, in 3 the brain was firm or compact, in 3 the quantity of fluid in the cranial cavity exceeded the normal amount, and in 1 it was less than normal.

Theories Relating to the Etiology of Cyanosis.—Although in nearly all cyanotic patients there are direct communications between the two sides of the heart, it is shown by many observations that these communications or apertures are not sufficient in themselves to produce cyanosis. This opinion was expressed half a century ago by Louis, who published an excellent monograph on the subject of these communications, basing his remarks on an analysis of twenty cases. Since the publication of this paper, the belief has been pretty general in the profession—and observations continue to substantiate it—that although the apertures may be of considerable size, if the two sides of the heart, with their orifices and vessels, are in their normal state, so that they act symmetrically and without obstruction, the blood is sufficiently oxygenated and decarbonized, and cyanosis does not occur. In proof of the correctness of this opinion many cases might be cited of a pervious and some of a largely dilated foramen ovale without the cyanotic hue—cases which have been published in the journals since the appearance of Louis' monograph. Still, in cases of obstructive malformation, unless the obstruction be complete, cyanosis is more likely to occur in consequence of these apertures, for were they absent a larger amount of blood would be propelled through the narrow orifice and a larger amount consequently be oxygenated.

Allusion has already been made to the two theories which prevail in the profession: the one attributing the non-oxygenation of the blood and its highly venous character, so as to cause the cyanotic hue, to the intermingling of venous and arterial blood; the other to obstruction at the centre of circulation and consequent venous congestion. There are serious objections to the acceptance of either theory as an explanation for all cases. That admixture of the two kinds of blood is not essential to the production of cyanosis is apparent from the following facts: In one case in the *Fourth Malformation* there was no communication between the two sides of the heart, and the ductus arteriosus was closed,

so that admixture was impossible. Again, in the *Eleventh Malformation*, or that in which the aorta and pulmonary artery are transposed, the blue disease evidently does not depend on the admixture of the two currents. On the other hand, in this curious state of the heart the more the admixture the less the cyanosis, since the only way in which the systemic current of blood can be arterialized is by passing to the opposite side of the heart. An argument against this doctrine may also be found in the fact that the modes of compensation are not such as in any way to diminish or obviate the admixture. It is admitted that in the more frequent malformations cyanosis is increased by the apertures, which allow the intermingling of the venous and arterial currents, but it is more reasonable to consider the intermingling and the cyanosis as the direct results of the malformation, neither having the precedence of the other, than to consider that they are related to each other as cause and effect or as proximate and remote results. Viewed in this light, the admixture must be considered simply a concomitant of the cyanosis.

The second theory, that of venous congestion, has numbered among its advocates many who have given special attention to the subject, as Morgagni, Louis, and Stillé, but it seems to have even less claim for acceptance than the theory of admixture. It has been seen that in nearly all cases of cyanosis the two sides of the heart communicate freely, so that if the current of blood meets with an obstruction, as it commonly does, it readily escapes to the opposite side, where the artery is large and gives it free passage. In this way congestion, if not prevented, is greatly diminished. Again, it will be seen that, although certain of the viscera are frequently found at the autopsy more or less congested, congestion is not uniformly present in the organs, as it would probably be were it the proximate cause in all cases of cyanosis.

Moreover, in some patients the malformation is not obstructive. The cavities and their orifices are of the normal size, and cyanosis is due entirely to malposition of the vessels. It cannot be said that in these cases there is venous congestion from arrest at the centre of circulation. If there be any congestion, it must be due to the fact that venous blood does not circulate as readily as the arterial in the capillaries. It is true that in the paroxysms of dyspnoea there is sometimes more or less congestion—the distension of the jugulars shows this—but it subsides with the paroxysms, and it probably is no more than usually occurs when respiration is greatly embarrassed.

In fine, attempts to express the immediate pathological state producing cyanosis in the terms of a general law have failed. However plausible the above theories may appear in regard to certain cases, there are others to which they are manifestly inapplicable. Those who advocate these theories seem to lose sight of the obvious fact that the

chief want of the economy in cyanosis is decarbonization of the blood, and it is hardly supposable that there can be any correct theory of its causation which is not founded on this fact. With this physiological state in view, it does not seem difficult to express a theory in comprehensive terms which is applicable to all cases, such as the following: Cyanosis is due to malformations of the heart and the great vessels in immediate relation with the heart, which prevent the proper flow of blood to and from the lungs, so that the oxygenation and decarbonization of this fluid are inadequate. So comprehensive a statement includes not only cases of malformation and malposition of the heart and its vessels, but also those few cases in which the lungs are in fault. In most patients, as we have seen, the current of blood *toward* the lungs is obstructed, and the current of blood *from* the lungs in those comparatively rare cases in which the malformation is on the left side.

Treatment.—From the nature of cyanosis it is evident that the treatment should be more hygienic than medicinal. The patient should be warmly clad and kept in a warm room, and all agencies calculated to embarrass or disturb the functions of the body or excite the emotions, and thereby accelerate the heart's action, should be studiously avoided. The diet should be nutritious, but simple and easily digested.

Those who have attributed cyanosis wholly to apertures in the interauricular and interventricular septa, and the consequent flow of blood from the right to the left side of the heart, have considered it an important part of the treatment to keep the patient reclining on the right side, so as to diminish this flow by the effect of gravitation. The reader, however, must be convinced from the nature of the malformations that little benefit can accrue from following such advice. Still, patients are sometimes less cyanotic and more comfortable in one position than another. In a case reported by Mr. Howship¹ "the only easy and indeed comfortable position in which the child could remain was that usual in nursing. When erect the dusky color of the face and neck became a dark-blue." In a case related by Mr. Spaekman² the patient was easiest on the hands and knees. Louis reports a case³ in which the selected position was with the head elevated; Wm. Hunter a case⁴ in which the patient avoided paroxysms by lying on the left side. Struthers and King each report a case in which the patients seemed most comfortable while lying on the right side; ⁵ while, on the other hand, Professor White of Buffalo⁶ and Dr. James Carson⁷ report cases in which position on the right side failed to produce any alleviation of symptoms. Other similar observations might be cited, but

¹ *Edin. Med. Journ.*, 1813.

² *De la Commun. des Cav., etc.*

³ *Monthly Journ. of Med. Sci.*

⁴ *Amer Journ. of Med. Sci.*, 1857.

⁵ *Lond. Med. Gaz.*, 1833.

⁶ *Med. Obs. and Eng.*, vol. vi.

⁷ *Buf. Med. Journ.*, 1855.

enough have been mentioned to show that no one position should be recommended for cyanotic patients. Some obtain most relief by lying on the back, others on the right side, others on the left; some when on the hands and knees, some when reclining on either side indifferently, while, finally, others suffer least when erect.

There was a time when the paroxysms were treated by venesection, but depletion has long since been abandoned. Physicians now rely on stimulants, antispasmodics, friction to the chest, and mustard pediluvia to relieve the urgent symptoms, although this treatment is but partially successful. It is probable that of all internal remedies digitalis is the most useful, from the fact that it is an efficient heart- tonic and more than any other medicine gives strength and equality to the heart-beats. In the cities where oxygen gas can be procured for daily inhalation the urgent symptoms may in some instances be partially relieved by the use of this agent.

CAPUT SUCCEDANEUM.—During the birth of the child extravasation of blood frequently occurs in the part of the scalp which presents. It results from the passive congestion which occurs in presenting parts, and is greatest in amount when the labor has been protracted and the labor-pains unusually severe. *Caput succedaneum* is the term employed to designate the swelling thus produced. Its seat is in the loose connective tissue between the scalp and pericranium, and it consists partly of extravasated blood, but largely of serum which has transuded from the congested vessels before that degree of congestion required to effect the transudation of corpuscles or rupture of capillaries was reached. I have repeatedly had an opportunity to examine this tumor in stillborn infants brought from the lying-in wards of the Nursery and Child's Hospital, and have found when it was slight that it consisted almost entirely of serum, but ordinarily when dissected it presented the appearance of a bruise, with a large proportion of serum, the blood and serum infiltrating the scalp to a greater or less distance beyond the appreciable limits of the tumor. *Caput succedaneum* requires no treatment. As it lies in the loose connective tissue of the scalp, its liquid permeates the open interspaces in this tissue in every direction, and is rapidly absorbed while the tumor disappears. Its subsidence is usually complete within twenty-four hours.

CEPHALHÆMATOMA.—Occasionally during birth blood is extravasated under the pericranium, detaching it from the bone. This commonly occurs in connection with *caput succedaneum*, and is observed when the latter declines. Its common seat is upon the occipital or parietal bone, near the posterior fontanelle, most frequently upon the parietal, where the pressure during labor is greatest. Prof. Henoeh states that the tumor does not obtain its maximum size immediately, but gradually increases by the continued escape of blood until the third day. The

tumor may extend over the entire surface of the bone, but does not pass beyond the suture; the suture limits its lateral extension. Cases of bilateral cephalhæmatoma have been reported, but they are rare. The tumor is fluctuating, and the skin covering it has the normal appearance or a bluish tinge, or it may exhibit infiltrations of blood like a bruise. Since the pericranium elevated by the blood does not lose its vitality, it begins to secrete from its under surface preparatory to the formation of bone. In a few days we are able to detect by pressure with the fingers a hard projecting rim at the border of the tumor, the result of the secretion and bony formation at the point where the pericranium is in part detached and in part adherent. If the tumor is tense, we are unable to detect the bone underneath by pressure, and the hard elevated rim resembles the edge of an opening in the skull. The cephalhæmatoma when not disturbed apparently causes little or no suffering, but the infant evinces pain if pressure be made upon it. Usually in the second week absorption is so far advanced that the tumor is less tense, and on pressure the bone can be felt underneath it. Complete absorption of the blood which has remained liquid usually occurs in four or five weeks.

Not infrequently, when absorption occurs slowly, a thin layer of bony substance forms in a few weeks on the under surface of the pericranium. This causes a creaking sound when pressure is made upon it. Some time since a specimen was presented to the New York Pathological Society by me showing a cephalhæmatoma and the mode of cure. The child died about two months after birth, and the blood constituting the tumor, which had been in great part absorbed, was completely encased by the old bone below and the new bony formation above. As the blood becomes absorbed the pericranium, having perhaps a bony formation on its under surface, gradually sinks; the cavity at length becomes obliterated; and there only remains some thickening of that part of the cranium which corresponds with the site of the tumor.

A cephalhæmatoma might be mistaken by the inexperienced for a congenital meningocele, since the ridge described above which forms along its border resembles so closely the edge of an opening, and both tumors are fluctuating; but a meningocele rarely occurs upon the part of the head occupied by the cephalhæmatoma; and if there be any doubt in the diagnosis at first, it will be dispelled in a few days by the changes which it undergoes.

The *treatment* should be expectant, except that a soft covering of cotton should be placed over it to prevent injury. Experienced physicians who formerly opened these tumors by an incision have abandoned this treatment, and recommend leaving them entirely to nature.

INFLAMMATION OF THE STERNO-CLEIDO-MASTOID MUSCLE (My-

ositis of the sterno-cleido-mastoid muscle; Hæmatoma of the sterno-cleido muscle).—We sometimes observe in infants, usually between the ages of one and six weeks, a hard tumor upon the antero-lateral aspect of the neck, corresponding to the site of the sterno-cleido-mastoid muscle, and evidently developed in this muscle. It is round or more frequently elongated, varying from the size and shape of a pigeon's egg to that of the little finger, occupying the anterior border of the muscle. Sometimes the tumor, hard like cartilage to the touch, extends over the anterior half of the muscle; and it is stated to occur more frequently in the right than in the left muscle. Prof. Henoch observed it on the right side in 16 cases and on the left side in 5 cases.

The following was a typical case: On July 19, 1887, I attended Mrs. S——, a primipara, in her confinement. Her labor, which was tedious; was terminated by the forceps, without any appreciable injury of mother or child. About one month after her confinement the mother stated that she had observed during the last two weeks an unusual swelling passing obliquely along the side of the neck of the child. I found the anterior portion of the sterno-cleido-mastoid muscle thickened and hard from a point about two lines above its lower attachment nearly its entire length. The swelling was of the size and shape of the little finger of a child of twelve years. It was tender to the touch, never had been red, and the infant's condition was normal in every other respect. At the age of nine weeks the tumor was still appreciable, but had nearly disappeared. Sometimes the tumor is not continuous, but the muscle is thickened and hardened in two or three different places. Occasionally the child's head is turned to one side, either from the pain in holding it erect or because the function of the muscle is impaired.

The etiology and nature of this tumor are apparent from the history. In a majority of the cases the birth of the infants affected with this ailment was tedious, and in many the presentation at birth was abnormal. This tumor is especially liable to occur after breech presentation, which necessitates traction upon the neck. In head presentations, when there is delay in liberating the shoulders and traction is made on the head, and especially if forcible rotation is made, the more superficial and exposed fibres in the sterno-cleido-mastoid muscle are liable to rupture; and when this occurs a local myositis occurs, causing the tenderness, infiltration, and swelling. Certain writers state that more or less extravasation of blood occurs at the time of the accident, and before the inflammation supervenes, and hence the term "hæmatoma" which has been employed to designate the disease. But I have seen no evidence of hemorrhage—none of the bluish discoloration so common in bruises which indicates extravasation in any of the cases which I have observed.

The *prognosis* is good. Suppuration does not occur unless under

very unusual circumstances, and, though probably more or less cicatricial tissue results at the seat of injury, the function of the muscle is not appreciably impaired when the inflammation and swelling abate. No perceptible contraction or deformity results. But little treatment is required; indeed, patients do well without treatment. But it is best for the infant that it maintain so far as possible a horizontal position, with the head resting on a pillow and with the avoidance of rotation so long as the disease is in its active stage and the tumor is tender to the touch. Probably cool lotions recommended by some are as likely to do harm as benefit by giving cold to the child and producing nasal or other catarrhs. Inunction with an absorbable ointment of iodide of potassium has been recommended for the purpose of promoting absorption, as the following:

R \bar{y} . Iodidi potass.,	
Aquæ,	<i>āā</i> . 1 part;
Adipis,	2 parts;
Lanolin,	6-8 parts.

But without this treatment absorption is progressive, and cure complete within a few weeks.

MAMMARY GLANDS.—In newly-born infants the secretion of a milk-like substance begins at about the fourth day in the mammary glands. It increases until the tenth day, when it gradually diminishes, and disappears at about the twentieth day. It is attended with some swelling of the glands during the period of their activity, and after the secretion ceases the enlargement gradually abates. M. Guillot states that this secretion presents under the microscope the appearance of colostrum.¹ A section of the gland in which this secretion has occurred, made near the surface, shows epithelium. At a greater depth the canals enlarge, divide, and end in cavities which are filled with a liquid having the appearance and character of colostrum. This glandular activity, it is said, may begin before birth, and continue six or eight weeks after birth, but the period of greatest enlargement and most active secretion of the gland is usually between the fourth and tenth days after birth, as stated above.

MASTITIS.—In exceptional instances the enlargement of the gland and its functional activity result more seriously. The gland becomes inflamed, and an abscess may occur as in the adult female. The nurse may produce this result by rubbing and pressing the gland, so that rude manipulation with it should be avoided. An abscess destroys the gland structure, which is a serious result if the infant be a female. M. Bouchut, in his practical treatise on diseases of the newly-born (p. 719, 1867), relates a fatal case of mastitis in which the inflammation extend-

¹ *Archiv de méd.*, 1853.

ed to the connective tissue, and ulceration so extensive occurred that the pectoral muscle was exposed, and death resulted from prostration. Dr. A. Jacobi has observed similar cases.¹ Therefore in treating the enlarged and secreting gland of early infancy very gentle and unirritating measures should be employed, so that mastitis may, if possible, be avoided. The dress should be loose, so as to avoid pressure on the gland. If no inflammation or inflammation in its commencement be present, absorbent cotton or cotton soaked with sweet oil should be applied and covered with oil silk. It is proper also to apply a mild lead wash to the enlarged mammary gland, especially if it be hot. If it be indolent, iodide of potassium in glycerin, one part of the former to ten of the latter, may be used. If the gland be hot, and especially if it be red, a soft emollient poultice should be applied, as of bread and milk or flaxseed and water. If, unfortunately, suppuration occur, an early incision should be made as far as possible from the nipple. In the subsequent treatment mild antiseptic washes, as borie acid or listerine and water, should be used. Corrosive sublimate should not be employed, as infants are readily poisoned by it, and, for the same reason, carbolic acid should not be used or be used in a very weak solution. Iodoform should also not be used, or used largely diluted by the addition of starch.

TETANUS NEONATORUM.—Tetanus or trismus is one of the earliest as well as most fatal diseases of the newborn. In New York City, containing a large laboring population in crowded tenement-houses and shanties, living in disregard of sanitary requirements, tetanus of the newborn is not infrequent, and it appears from statistics to occur in all localities where insanitary conditions exist and the habits of the people are uncleanly. Tetanus is more common in the first and second weeks of life than at any other age; and in at least some localities, if it be not the universal rule, as it probably is, more cases occur in the newborn than in the entire subsequent life. Although tetanus neonatorum has been carefully investigated by many observers, considerable diversity of opinion still exists in regard to its etiology.

I have collated and tabulated the following cases in which the histories were so complete that there could be no error of diagnosis:

FATAL CASES.

1. Male; taken when three days old; lived sixty hours. Labatt, *Edin. Med. and Surg. Journ.*, April, 1819.
2. Female; taken when three days old; lived forty hours. *Ibid.*
3. Taken when five days old; lived fifty hours. *Ibid.*
4. Taken when three days old; lived one day. *Ibid.*
5. Male; taken when two days old; lived two days. Billard, *Treatise on Diseases of Children*, Stewart's trans., p. 477.
6. Male; taken when three days old; lived two days. Romberg.

¹ *Archives of Pediatrics*, March, 1888.

7. Male; taken when six days old; lived ninety-three hours. Dr. Imlach, *Month. Journ. of Med. Sci.*, Aug., 1850.
8. Female; taken at five days; lived four days. Caleb Woodworth, M. D., *Boston Med. and Surg. Journ.*, Dec. 13, 1831.
9. Negro; taken at seven days; lived twenty-four hours. P. C. Gaillard, M. D., *South. Journ. Med. and Phur.*, Sept., 1846.
10. Male; taken when seven days old; lived one day. Augustus Eberle, M. D., *Missouri Med. and Surg. Journ.*, 1847.
11. Taken when seven days old. D. B. Nailer, *N. O. Med. Journ.*, Nov., 1846.
12. Male; taken when three days old; lived one day. *N. O. Med. and Surg. Journ.*, May, 1853.
13. Negro; taken when three days old; lived three days. Robert H. Chin, M. D., *N. O. Med. and Surg. Journ.*
14. Taken when two days old; died in four hours after the doctor's visit. *Ibid.*
15. Taken when seven days old; lived one day. C. H. Cleveland, *New Jersey Med. Rep.*, April, 1852.
16. Negro; taken when seven days old; death finally. Greenville Dowell, *Amer. Journ. of Med. Sci.*, Jan., 1863.
17. Taken when twelve days old; lived one day. Thomas C. Boswell, communicated to Dr. Sims, *Amer. Journ. of Med. Sci.*, 1846.
18. Taken when about five days old; died at about the age of nine days. B. R. Jones, *Ibid.*
19. Taken at or soon after birth; lived two days. Dr. Sims, *Amer. Journ. of Med. Sci.*, Apr., 1846.
20. Taken at the age of six days; lived one day. *Ibid.*
21. Taken when three days old; lived two days. *Ibid.*
22. Male; taken at the age of eight days; died in three hours. Communicated to the writer.
23. Taken at the age of twelve hours; lived two days. Communicated to the writer.
24. Female; taken when seven days old; lived forty-five hours. The writer.
25. Male; taken at the age of seven days; lived about forty-eight hours. *Ibid.*
26. Female; taken at the age of eight days; lived three days. *Ibid.*
27. Female; taken at the age of five days; lived three days. *Ibid.*
28. Female; taken when four days old; lived two days. *Ibid.*
29. Taken when six days old; died next day. *Ibid.*
30. Taken when five days old; lived twenty-four hours. *Ibid.*
31. Taken when eight days old; lived two days. *Ibid.*
32. Male; taken when five days old; lived one day. *Ibid.*

FAVORABLE CASES.

1. Negro; female; taken when three days old; recovered in a few days. Robert S. Baily, *Charleston Med. Journ. and Rev.*, Nov., 1848.
2. Negro; taken at eleven days; recovered in fifteen days. W. B. Lindsay, *N. O. Med. Journ.*, Sept., 1846.
3. Negro; taken when ten days old; recovered in thirty-one days. P. C. Gaillard, *Charleston Med. Journ. and Rev.*, Nov., 1853.
4. Male; taken at the age of eight days; recovered in twenty-eight days. *Ibid.*
5. Negro; taken at seven days; recovered in fifteen days. Augustus Eberle, *Missouri Med. and Surg. Journ.*, 1847.
6. Taken when eight days old; recovered in four weeks. Furlong, *Edin. Med. and Surg. Journ.*, Jan., 1830.
7. Taken at the age of one week; recovered in two days. Dr. Sims, *Amer. Journ. of Med. Sci.*, April, 1846.
8. Female; taken at the age of three days; recovered in five weeks. The writer.

the *landphysicus* of Iceland to visit Heimacy and ascertain the nature of the disease which was so destructive to the infants. Although this gentleman, from his brief stay, saw no case himself, he obtained interesting particulars in reference to the disease from the priests and parents. At this time scarcely an infant escaped. Again, according to Dr. Schleisner, whose report in reference to the same locality was published forty years later, tetanus was still the most fatal of all infantile maladies.

Tetanus infantum is also represented as very fatal in the island of St. Kilda, off the coast of Scotland. In the temperate regions of America and Europe cases are not frequent, except occasionally in the poor quarters of the cities, in foundling hospitals, and rarely in country towns, where the conditions are favorable for its occurrence. The records of the Dublin, Stuttgart, and Stockholm lying-in asylums furnish many cases. In the town of Fulda, Germany, in 1802, Dr. Schneider saw 6 cases in fourteen days, while a midwife in the same place stated that she had seen more than 60 in nine years.

But the greatest mortality from tetanus infantum is in the warm climates both of the Eastern and Western hemispheres. In the West Indies, the southern portion of the United States, the equatorial regions of South America, and in the islands of Minorca and Bourbon, it has in many localities been the most frequent and fatal of infantile maladies.

It is an interesting fact that in the warm regions of the United States the victims are chiefly negro infants. L. S. Grier, M. D., of Mississippi, says in the *N. O. Med. and Surg. Journ.*, May, 1854: "The first form of disease which assails the negro among us is trismus. The mortality from this disease alone is very great. No statistical record, we suppose, has even been attempted, but from our individual experience we are almost willing to affirm that it decimates the African race upon our plantations within the first week of independent existence. We have known more than one instance in which, of the births for one year, one-half became the victims of this disease, and that, too, in spite of the utmost watchfulness and care on the part of both planter and physician. Other places are more fortunate, but all suffer more or less; and the planter who escapes a year without having to record a case of trismus nascentium may congratulate himself on being more favored than his neighbors, and prepare himself for his own allotment, which is surely and speedily to arrive." Dr. Wooten¹ says: "It is a disease of fatal frequency on the cotton plantations in this section of Alabama." He has, however, never seen a white child affected with it.

In New Orleans, according to the death-statistics in our possession—which, however, relate to only one year—tetanus infantum is the most

¹ *N. O. Med. and Surg. Journ.*, May, 1846.

fatal of all diseases except phthisis. Mr. Maxwell says, in the *Jamaica Physical Journal*,¹ "From observations that I have made for a series of years . . . I found that the depopulating influence of trismus neonatorum was not less than 25 per cent. It scarcely has a parallel within the bills of mortality." This gentleman's observations relate to the West Indies. Similar statements are made in reference to this malady as it occurs in Cayenne and Demerara in South America.

While tetanus infantum prevails in regions wide apart and presenting very diverse climatic conditions, there is a similarity as regards the personal and domiciliary habits of the people who suffer most from its occurrence. It occurs chiefly among those who are filthy and degraded in their habits—who live, either from choice or necessity, in neglect of sanitary requirements.

Causes.—That uncleanness and improper air are a cause of tetanus is as fully demonstrated as most facts in the etiology of diseases. The attention of the profession was forcibly directed to this cause by Dr. Joseph Clarke in a paper read before the Royal Irish Academy in 1789. This physician was in charge of the Dublin Lying-in Asylum, and had rightly concluded that the mortality among the newborn infants was due to imperfect ventilation. Through his advice, apertures twenty-four inches by six were made in the ceiling of each ward; three holes, an inch in diameter, were bored in each window-frame; the upper part of the doors leading into the gallery were also perforated with sixteen one-inch apertures; and the number of beds was reduced. The results of these simple sanitary regulations may be seen from Dr. Clarke's own statement. He says: "At the conclusion of the year 1782, of 17,650 infants born alive in the Lying-in Hospital of this city, 2944 had died within the first fortnight; that is, nearly every sixth child." The disease in 19 cases out of 20 was tetanus. After the wards were better ventilated—namely, from 1782 till the time of the preparation of Dr. Clarke's paper—8033 children were born in the hospital, and only 419 in all had died, or about 1 in 19. So impressed was Dr. Evory Kennedy, who at a later period had charge of the same asylum, with the belief that Dr. Clarke had discovered the true cause and had been able in great measure to prevent it, that he thus expresses his convictions: "If we except Dr. Jenner, I know of no physician who has so far benefited his species, making the actual calculation of human life saved the criterion of his improvements." The cases occurring in my own practice have almost all been in tenement-houses, where habits of cleanliness are not observed, and I have not yet seen in the practice of others nor heard of a case which occurred in the better class of domiciles. The statement of physicians in the Southern States, who speak from extensive observation among the negroes, are strongly corrobor-

¹ Copied in the *London Lancet*, April 11, 1835.

rative of the opinion that the disease is in great measure due to uncleanness and impure air.

Dr. Greenville Dowell of Texas states that he has been able to trace tetanus infantum to the bed-clothes saturated with excrementitious matters which are found in the negro cabins. In a paper published in the *Nashville Journ. of Med. and Surg.*, June, 1851, by Prof. John M. Watson, the frequency of this disease among the negroes is accounted for as follows: "When called to see their children we find their clothes wet around their hips, and often up to their armpits, with urine. . . . The child is thus presented to us when, on examination, we find the umbilical dressings not only wet with urine, but soiled likewise with feces, freely giving off an offensive urinous and fecal odor, combined at times with a gangrenous fetor arising from the decomposition, not desiccation, of the cord."

Another cause is believed to be some irritation in the intestines, as from retained meconium. Observers in the Southern States and elsewhere occasionally mention this as a cause. In one case treated by myself there was obstinate constipation immediately before the attack, and in another diarrhœa preceded and was the only apparent cause.

In certain cases the assignable cause is exposure to wet or cold or to a variable temperature, which also occasionally produces tetanus in the adult. Prof. Cedersehjold attributed the epidemic which he observed in Stockholm to a sudden change of temperature from hot weather in May to frosty in June. In a case related by Dr. P. C. Gaillard in the *Southern Journ. of Med. and Pharmacy*, Sept., 1846, the disease commenced as follows: The nurse came in with wet apron and clothes in the evening; a short time after she had taken the child into her lap it sneezed violently two or three times. At 10 P. M. tetanus began. In certain localities on the Continent where there are no parish churches the frequent occurrence of tetanus has been attributed by the physicians to the practice of carrying the infants to a distance to be christened, thus exposing them to the winds. In this city I have observed tetanus after a similar exposure. The influence of the weather in the production of tetanus of the newborn is also shown by facts observed in the Stuttgart hospital. In an aggregate of 25 cases treated in that institution, all but 3 occurred in the cold months. In the island of Cayenne, at a hamlet surrounded by mountains and dense forests, tetanus attacked only 1 in every 12 or 15 of the infants. After a great part of the forests had been cut down, so as to allow access to the cold sea-winds, almost all the newborn infants fell victims to tetanus.¹

Hein relates that a citizen of Berlin lost successively two children with tetanus soon after birth. When the second child fell ill he observed

¹ Insel. Cayenne.

that its cradle was exposed to a current of air. At the third accouchement the position of the cradle was changed and the infant escaped. Exposure to wet and cold has been long recognized as a cause of the disease. According to Sauvages, “*Hic morbus hieme et eum aurâ humidâ sæpius advenit quam siccâ æstate.*”¹

The causes of infantile tetanus, enumerated above, may be proximate or remote—may produce the disease by their direct effect on the system or indirectly by causing a pathological state which in turn leads to the development of the disease. There are other direct causes—namely, organic affections. In the bodies of the newborn who die of tetanus lesions are observed which doubtless result from the spasms. Again, others are found which from their nature could not be a result, and which, being observed in different cases, are to be regarded as causes. The most frequent of such lesions is inflammation of the umbilicus or umbilical vessels.

Mosehion, who lived in the first century of the Christian era, stated in writings still extant that stagnant blood in the umbilical vessels sometimes produced dangerous disease in the newborn infant; and it is supposed, though this is doubtful, that he referred to tetanus. In modern times the attention of the profession was more particularly directed to this cause by a paper published by Dr. Colles in the first volume of the *Dublin Hospital Reports* in 1818. The observations contained in this paper were made in the Dublin Lying-in-Hospital during the period of five years. In each of these years he had witnessed from three to five post-mortem examinations in cases of infantile tetanus, and the lesions, he states, were in all much alike, as follows: The floor of the umbilical fossa was lined by a membrane apparently formed by suppurative inflammation, and in the centre of this fossa was a large papilla. This papilla consisted of a soft yellow substance, apparently the product of inflammation, and in all the cases the umbilical vessels were in contact with this substance and were pervious. In a few instances superficial ulcerations were found near the mouth of the umbilical vein, and occasionally the skin surrounding the umbilicus was raised. The peritoneum covering the vein was highly vascular, often not to a greater distance than an inch above the umbilicus, but sometimes as far as the fissure of the liver. The peritoneum in the course of the umbilical arteries presented the inflammatory appearance in still greater degree, sometimes as far as the sides of the bladder. The connective tissue lying along the arteries and urachus anteriorly was loaded with a yellow watery fluid. The inner surface of the umbilical vein was not inflamed, but its coats, in general, were thickened. On slitting open the arteries a thick yellow fluid resembling coagulable lymph was found within their coats, and in all cases these

¹ *Nosol. Method.*, vol. i. p. 531.

vessels were thickened and hardened as far as the fundus of the bladder.

Dr. Finckh, who observed 25 cases in the Stuttgart hospital, believes that the most frequent cause was suppuration or ulceration of the umbilical cord. In 10 of the 25 cases the navel was dry and cicatrized; in the remainder it was either wet or swollen, with a bluish-red inflamed edge at the margin of the navel; a dirty viscid pus covered the umbilical depression.

Dr. Levy, physician of the Foundling Hospital in Copenhagen, attended 22 cases in that institution in 1838 and 1839. Of these, 20 died, and 15 were examined carefully after death. In 14 there were decided marks of inflammation in the umbilical arteries, especially those portions lying along the urinary bladder; in several cases the peritoneum over the arteries was much injected, and in 3 adherent either to the omentum or intestine by coagulable lymph; the coats of the arteries were thickened, their cavities dilated and containing dark reddish-brown or greenish puriform matter, always fetid. Sometimes the arterial tunica interna was found ulcerated and absent in places, and there was spongy thickening of the subjacent connective tissue. In 2 cases the ulcerative process had extended from the tunica interna to the peritoneum, and there was a deposit of thick ichorous matter around the ulcer; in 1 case both arteries were so softened that their coats were scarcely distinguishable, and in another these vessels had become gangrenous. The appearance of the umbilicus was unchanged in 4 cases; in 10 the fundus was red and filled with puriform fluid, which quickly reappeared when removed, and, in general, shortly before death the navel presented a greenish color.

According to Romberg, Dr. Schöller made post-mortem examinations in 18 cases of tetanus infantum, and in 15 found inflammation of the umbilical arteries. These vessels were swollen near the bladder, in 1 case to the diameter of four lines, and were found to contain pus. The lining membrane was eroded or covered with an albuminous exudation. Both arteries were not always equally inflamed, and in 3 cases only one was affected.

Schneeman found minute points of suppuration in the umbilical vein in 8 cases,¹ and pus throughout the course of this vessel in 1.

The observations mentioned above were made, for the most part, in hospitals on the Continent, but similar observations have been made in private practice. M. Borian of the isle of Bourbon says that he has found in every case inflammation around the umbilicus.² Dr. John Furlong,³ who resided at St. John's, Antigua, attributes the disease to improper dressing of the umbilicus. The same opinion is expressed

¹ *Holscher's Annalen*, vol. v. p. 484, 1840.

² *Gaz. médicale*, Paris, July 11, 1841.

³ *Edin. Med. and Surg. Journ.*, Jan., 1830.

by Mr. Maxwell, who also saw the disease in the West Indies.¹ Dr. Ransom states, in a communication to Prof. John M. Watson,² that he has never seen a case of tetanus of the newborn in which the umbilicus was healthy. In a case related by Robert S. Bailey in the *Charleston Med. Journ. and Rev.*, Nov., 1848, there was a hard scab on one side of the umbilicus, and this part was much distended. A discharge followed the removal of the scab, and the child recovered. In a favorable case related by W. B. Lindsay in the *N. O. Med. and Surg. Journ.*, Sept., 1846, the umbilicus was tumid and not disposed to heal. Dr. H. O. Wooten (same journal, May, 1846) attributes the disease to the condition of the umbilicus and umbilical vessels, and states that he has found the umbilicus gangrenous. In a case related in the *N. O. Med. and Surg. Journ.*, May 1, 1853, the umbilical vessels were blocked up by purulent matter. Robert A. Chime, M. D., Brazoria, Texas,³ believes one cause of the disease to be improper tying and management of the umbilical cord, by which a diseased state is produced which extends to the umbilicus and thence to the viscera. At a meeting of the Obstetrical Society of Edinburgh, held April 24, 1850, Dr. Imlach related a case in which there was a dark and gangrenous appearance on the integument around the umbilicus, and the peritoncum underneath was also dark, but not inflamed; umbilical vein healthy; a little fibrin in the left umbilical artery; right umbilical artery much diseased; its two inner coats apparently destroyed, and in their place a yellow pul-taceous slough, in which pus-globules were discovered with the microscope.

Two cases in which tetanus apparently originated from disease of the umbilicus were reported in the *Medical Times*, Dec., 1884, by Mr. Golden. In the first case tetanus began on the seventh day after birth, the child refusing the breast and tetanus being well marked. In a few hours the spasms were severe and frequent. The umbilicus, which had a dirty, neglected appearance, discharged a sanguineo-purulent liquid, and bled when touched. The cord had not separated. Death occurred in eighteen hours. In the second case the disease did not occur until the fourteenth day, when the characteristic tetanic rigidity of the muscles indicated the nature of the attack. Occupying the site of the umbilicus was a red, irregular, sloughy sore, which had existed nearly from birth. The temperature rose to 106.4°, and the child died asphyxiated in a wasted state.

Recently, Dr. F. M. Wright of Nottingham, England, has related two cases in which the cause was apparently located in the umbilicus.⁴ Mrs. D——, having six healthy children, gave birth to a boy on Jan.

¹ *Jamaica Phys. Journ.*, copied into the *London Lancet*, April 11, 1855.

² *Nashville Journ. of Med. and Surg.*, June, 1851.

³ *N. O. Med. and Surg. Journ.*, Sept., 1854.

⁴ *Brit. Med. Journ.*, May 22, 1886.

6, 1883. He was robust and his appearance normal, but the cord had three or four times its ordinary size, and had a darker color than usual. On the sixth day the umbilicus and the parts in immediate relation with it were inflamed, and on the seventh day the inflammation had increased and the cord separated. The child progressed favorably a few days, when it refused the breast; its jaws became fixed, and its whole body rigid from head to foot. It had spasms in which the tonic convulsions were increased. Death resulted. In 1886, Mrs. D—— lost another newborn infant from tetanus, but the cause may not have been located at the umbilicus, which presented the normal appearance.

Since umbilical inflammation has been observed in so many cases of tetanus neonatorum, there can be little doubt that it sustains a causal relation to it in those cases in which it occurs. It seems probable, in the light of recent investigations, that the umbilical disease has a microbial origin, and hence its comparative frequency in families and domiciles where the air is impure from habitual uncleanness and a disregard of sanitary requirements. (See art. "Sepsis.")

But cases of tetanus of the newborn occur in which no umbilical disease can be detected. Dr. Finek of Stuttgart examined the umbilical vessels in 11 cases without discovering any pathological change. Dr. Samuel B. Labatt, master of the Dublin Lying-in Hospital, published in the *Edin. Med. and Surg. Journ.*, April, 1819, a paper entitled "An Inquiry into an Alleged Connection between Trismus Nascentium and certain Diseased Appearances in the Umbilicus." This paper was designed as a reply to the essay of Dr. Colles. Dr. Labatt relates several cases in which there was no disease of the umbilicus and umbilical vessels, and others in which the disease was so slight that it probably produced no injurious effect on the health of the child. Dr. James Thompson, who spent considerable time in the tropical regions, says:¹ "I have myself examined nearly 40 cases of infants that have sunk under this complaint. In many I have looked at no other part but the navel, and have found it in all states—sometimes perfectly healed, especially if the infants had lived several days; at other times a simple clean wound. When death occurred on the fifth or sixth day the wound was frequently in a raw state. I never yet saw it in a sphacelated condition." This writer concludes from his observations that there are cases in which the cause is located elsewhere than in the umbilicus or umbilical vessels. In the *Dub. Journ. of Med. and Chem. Sci.*, Jan., 1836, Dr. John Breen remarks: "From dissections . . . we have never been able to discover any peculiar morbid appearance which would justify us in offering any explanation of the pathology of the disease." In my own cases there was no evidence of disease of the umbilicus or umbilical vessels, so far as

¹ *Edin. Med. and Surg. Journ.*, Jan., 1822.

could be ascertained by external examination, and in one (No. 32) a careful post-mortem examination disclosed no lesion of these parts.

The inference from the above observations is that, although umbilical disease is an occasional, probably not infrequent, cause of tetanus infantum, cases occur in which such disease is not present, and we must look for the cause elsewhere. From the nature of tetanus infantum the cerebro-spinal axis has been from time to time examined in those who have died of this malady, and occasionally sufficient cause has been found in this part of the system.

I have alluded in another connection to a case from Billard in which tetanic rigidity occurred in an infant three days old as the result of spinal meningitis. That tonic spasms not infrequently occur in older children in consequence of meningeal inflammation is well known, and in some of the reported epidemics of infantile tetanus meningitis was really present, and was doubtless the cause of the spasms. Such an epidemic was observed by Prof. Cederskjöld in Stockholm in 1834. Within a few months he treated 42 cases, and in addition to the lesions which are known to result from tetanus he found in the bodies examined a plastic exudation at the base of the brain. Finckh of Stuttgart made 20 post-mortem examinations of those who had died of this disease, and in 9 found spinal meningeal inflammation.

Meningitis in the newborn is, however, rare, and we must regard it as an exceptional cause of tetanus.

In 1846 there appeared from the pen of Dr. Sims, then practising at Montgomery, Alabama, a paper designed to show that tetanus of the newborn is produced by pressure exerted on the nervous centre through depression of the occipital bone. In 1848 the same writer published a second paper, also in the *Amer. Journ. of Med. Sci.*, fully enunciating his theory as follows: "That trismus neonatorum is a disease of centric origin, depending on a mechanical pressure exerted on the medulla oblongata and its nerves; that this pressure is the result, most generally, of an inward displacement of the occipital bone, often very perceptible, but sometimes so slight as to be detected with difficulty; that this displaced condition of the occiput is one of the fixed physiological laws of the parturient state; that when it persists for any length of time after birth it becomes a pathological condition, capable of producing all the symptoms characterizing trismus neonatorum, which are instantly relieved simply by rectifying this abnormal displacement and thereby removing pressure from the base of the brain." In both papers cases are narrated in support of this theory. Recently, Dr. J. F. Hartigan,¹ has advocated Sims' theory. He says if any one doubts its correctness, let him make pressure on the occiput with the fingers, and convulsions can be produced at will. But there are serious objections

¹ *Med. Journ.*, Jan. 3, 1885; *Arch. of Pediatrics*, March 15, 1885.

to this mode of explaining the occurrence of the disease. In the first place, if this explanation were correct, tetanus ought ordinarily to occur sooner, for the occiput is as much depressed previously as, and in the majority of cases more depressed than, at the period when it does actually commence. Pressure on the medulla would certainly be followed by immediate and marked symptoms, instead of an immunity for four or five days.

Again, well-known facts in reference to the causation of tetanus infantum conflict with Dr. Sims' theory, as, for example, epidemics of the disease, its prevalence in one locality and absence in another, although no particular attention be given to the position of the infant; the diminution of the number of cases by greater attention to cleanliness, of which there is abundant proof. Moreover, there are many reported cases of this disease at the commencement of which there was no perceptible displacement of the occipital bone.

The inequality of the cranial bones often observed in tetanus infantum should, in my opinion, be explained as follows: When the newborn infant becomes emaciated the volume of the brain is diminished, like that of the trunk or limbs, and the sinking of the occipital bone simply corresponds with the amount of waste in the cerebral substance. Whatever the disease in the young infant, if there be much emaciation the parietal bones will usually be found more prominent than the occipital. Now, in fatal tetanus infantum emaciation is very rapid; those fleshy and plump, if the disease do not speedily end, become pinched and wrinkled. Viewed in this light, the occipital depression should be regarded as a result, and not a cause, of the tetanus.

Although we do not accept the theory which attributes tetanus infantum to occipital depression, there are a few cases on record in which it was apparently due to injury of the head received at birth. Dr. Sims has related one such case, that of a negro infant. The mistress, an observing lady, gave to Dr. Sims the following account of it: Its head was "mightily mashed. . . . The bones seemed to be loose. I got it to take a little boiled milk on the first day, but it swallowed very little, and very badly, for its jaws seemed to be locked, On the next day it took spasms and got stiff all over; its hands were shut up tight, and its arms were bent up so (she placed her forearms at right angles). Every time I touched it the spasm would get worse all over, screwing up its face till it was the ugliest thing in the world; and when the spasms wore off it looked as well as any other newborn baby. But then the stiffness never left it, and the spasms kept on coming and going till it died." It lived two days.

It is evident, from the description given by the mistress, that this was a case of tetanus commencing at or so soon after birth that it seemed almost congenital. The apparent cause was injury of the head

occurring in consequence of protracted birth, the infant being resuscitated with difficulty after several minutes.

Dr. W. C. Sutton published a similar case in the *Nashville Journ. of Med. and Surg.*, April, 1853. The infant at birth was apparently dead, but was resuscitated so as to live eighteen hours in a state of tetanic rigidity. In cases in which tetanus begins at birth, doubtless the cerebro-spinal axis is in some way affected; but in the absence of post-mortem examinations the exact nature of the lesion is uncertain.

It is evident, therefore, that in this disease, as in eclampsia, the cause in different cases may be entirely distinct. Dr. James Johnson many years ago expressed his belief in the multiplicity of causes, and he had been a careful and intelligent observer in the West Indies.

The causes may be arranged in two groups—one external, the other internal. In the first group should be placed imperfect ventilation, personal and domiciliary uncleanness, and atmospheric vicissitudes; in the second group, so far as ascertained, inflammation of the umbilicus and umbilical vessels, meningitis, and, rarely, injury of the cerebro-spinal axis during birth.

The lesions resulting from tetanus infantum pertain chiefly to the circulatory system. In the cases examined by Prof. Cederschjold of Stockholm, already alluded to, the meningeal and cerebral vessels and those of the spinal cord, the cavities of the heart, and the large vessels connected with the heart, were distended with blood.

Anatomical Characters.—Finckh made post-mortem inspection of 20 cases in the Stuttgart hospital, the bodies at death having been placed on their faces in order to prevent any deceptive appearance from the gravitation of blood. In 4 of the cases the spinal cord and its meninges presented the normal appearance. In the remaining 16 there was effusion of blood in considerable quantity the whole length of the spinal cord, between the bony walls and the dura mater. It should be stated, however, that spinal meningeal inflammation was present in 9 of the 16, though the extravasation did not probably result from the inflammation, but from the tetanus. The blood in Finckh's cases was very dark—sometimes fluid, at other times coagulated. In 1 case no anatomical change was observed in the brain or its membranes. In the remaining 19 more or less extravasated blood was found on the surface of the brain or in its interior. The substance of the brain was healthy, as also its membranes, except the congestion. The only abnormal appearance observed in the thoracic and abdominal viscera was strong contraction of some portion of the intestinal tube in 5 cases. Dr. West says: "The most frequent post-mortem appearances in these cases"—referring to tetanus infantum—"and that which I found in the bodies of all the four children whom I observed, consists of effusion of blood, either fluid or coagulated, into the cellular tissue surrounding the theca

of the cord. Conjoined with this there is generally a congested state of the vessels of the spinal arachnoid, and sometimes an effusion of blood or serum into its cavity. The signs of congestion about the head are less constant, though much oftener present than absent, and sometimes existing in an extreme degree; while in one instance I found not merely a highly congested state of the cerebral vessels, but also an effusion of blood in considerable quantity between the skull and dura mater, and also a slighter effusion into the arachnoid cavity." Dr. Weber of Kiel also placed infants who had died of tetanus on their faces, and, without exception, found injection of the capillaries of the cord and spinal meninges and extravasation of blood. M. Matuszynski, according to Bouchut, "has observed effusions of blood of variable quantity in the cerebral pia mater, in the ventricles, and in the choroid plexuses, with considerable injection of the membranes of the brain. He had also seen serous infiltration beneath the arachnoid, and serous effusion into the ventricles, accompanied by a diminution of the consistence of the cerebral substance." In two cases examined by myself there was intense injection of the cerebral meninges and of the meninges of the upper part of the spine, but no extravasation was noticed. The spinal canal was not opened. In a third case, in which the spinal cord was opened, extravasation of blood and marked congestion of the vessels were observed in and under the spinal meninges.

Dr. H. O. Wooten¹ states that he has made several post-mortem examinations, and has found the pathological appearances as uniform as in any other disease, as follows: "Engorgement of the substance of the brain and of the meninges lining the base of the brain, the medulla oblongata, and spinal marrow; liver congested."

In a case related by Dr. Imlach before the Edinburgh Obstetrical Society, April 24, 1850, the upper part of the lungs was healthy, the posterior portion congested and containing many dark points; heart and liver healthy; small intestines of a light-brown color; stomach and large intestines pallid; there had been umbilical hemorrhage.

Romberg states that he found in a child whose death occurred from this disease such intense congestion of the veins and sinuses of the brain that a slight touch and the removal of the cranial bones produced extravasation of the partly coagulated and partly fluid blood. Dr. Schöller, on the other hand, found an actual extravasation of blood in the spinal canal in only 1 case in 18.

At the autopsy of a case treated by Dr. Godler, related above, the umbilical ulcer present was found to have no communication with the abdominal cavity; brain very soft; fluid blood in longitudinal and lateral sinuses; dura mater healthy; pia mater hyperæmic; a small quantity of fluid in ventricles; small punctate hemorrhages; the

¹ *N. O. Med. and Surg. Journ.*, May, 1846.

dura mater firm and the internal surface smooth; a small quantity of thick, clear fluid in cavity of arachnoid; pia mater injected and somewhat adherent to the cord; cord hyperæmic and soft; no other abnormal appearances observed.

It is seen from the above observations that tetanus of the infant is ordinarily accompanied by great passive congestion, which is especially marked in the cerebro-spinal axis, and that frequently extravasations occur from the distended capillaries. The embarrassment of respiration and the retarded circulation of blood consequent on the tetanic rigidity afford sufficient explanation of this state of the vessels.

Symptoms.—In many cases premonitory symptoms are absent or are so slight as to escape notice. Sometimes there is a degree of fretfulness previously, but no more than is often observed in those who continue in good health. The first symptom which alarms the parents and shows the grave nature of the commencing disease is inability to nurse or evident pain and hesitation in nursing. Commencing with rigidity of the masseters, the disease gradually extends to the other voluntary muscles, and in the course of a few hours the muscles of the limbs as well as of the trunk are involved. Persistent muscular contraction, which is the pathognomonic feature of infantile tetanus, is developed not fully in the beginning, but by degrees in each affected muscle, so that it is not till after the lapse of several hours, perhaps even a day, that the greatest amount of rigidity is attained. Therefore, in the commencement of the disease the limbs can be bent and the jaws pressed open more readily than at a subsequent stage, though with manifest pain to the infant.

During the period of maximum rigidity the jaws are fixed almost immovably, often with a little interspace between them, against which the tongue presses and in which frothy saliva collects. The head is thrown backward, and held in a fixed position by the stiffness of the cervical muscles. The forearms are flexed; the thumbs are thrown across the palms of the hands and are firmly clenched by the fingers; the thighs are drawn toward the trunk; the great toes are adducted and the other toes flexed. Occasionally opisthotonos results from the extreme contraction of the dorsal and posterior cervical muscles. The infant can sometimes be raised, without any yielding of the muscles, by one hand under the occiput and the other under the heels.

The rigidity is liable to variation in its intensity, even after the full development of the disease. If the infant be quiet, especially if asleep, the muscles are partially relaxed to such an extent sometimes, in the first stages of the complaint, that the features have a placid and natural expression, though only for a short time. There are frequent exacerbations in the muscular contraction, sometimes occurring

without any apparent cause, and sometimes produced by anything which excites or disturbs the child. Attempts to open the lips or jaws or eyelids or to bend the limbs, blowing on the face, or even the crawling of a fly upon it, occasions the paroxysm.

During the paroxysm the eyelids are forcibly compressed, as well as the lips, which are either drawn in or are pouting; the forehead and cheeks are thrown into wrinkles, and the physiognomy is indicative of great suffering. The unnatural conditions of the trunk and limbs which result from the muscular contraction are increased for the moment; the head is more forcibly thrown back and the limbs more strongly flexed. The muscular movements which occur during the paroxysms are sometimes described as clonic spasms. There is indeed occasionally some quivering of the limbs, and yet, as I have on different occasions noticed, so far from the muscular action being a clonic spasm, it is clearly tonic, and is intensified during the paroxysm. In fatal cases the paroxysms occur more and more frequently until the period of collapse.

The crying of the child affected by tetanus is never loud, however great the suffering. It is variously described by writers as "whimpering" or "whining." It is of this suppressed character in consequence of the rigid state of the respiratory muscles and their imperfect movement.

During the exacerbation respiration is suspended, or so imperfect and the circulation so retarded that the surface becomes of a deep-red, almost livid color. Sometimes epistaxis occurs, affording partial relief to the congestion, and sometimes, though less frequently, the blood forces itself from the congested liver along the umbilical vein and escapes from the umbilicus. The intense passive congestion consequent on the tetanic spasm is general throughout the system, but extravasation of blood appears to be more common around the brain and spinal cord than elsewhere.

The frequency of the pulse and respiration varies in different cases and at different stages of the same case. It is often somewhat accelerated, but at other times is natural, or is even slower than in health.

While the appetite of the infant, to appearance, is not diminished, the pain which it experiences in nursing is such that alimentation is necessarily deficient. It can be fed with a spoon for a time after it ceases to take food in the natural way, but artificial feeding soon fails. The milk placed in its mouth is in great part pressed back through the violence of the spasm which is induced by the attempt to feed it.

In consequence of imperfect nutrition the infant rapidly wastes away. There is no other disease except the diarrhoeal affections in which ema-

ciation is so rapid. In a case related by Dr. W. B. Lindsay in the *N. O. Med. Journ.*, Sept., 1846, the record states that "the infant was fat three days before, but was now emaciated." Romberg, who saw tetanus infantum in European hospitals, and Dr. Robert H. Chinn of Texas,¹ both speak of the rapid emaciation. The trunk and extremities lose their fulness and the features become pinched. Several observers have noticed the appearance of miliaria in this reduced state of the system, especially around the shoulders, and sometimes a decidedly icteric hue appears on the skin.

The condition of the intestines is not uniform. They may be relaxed, particularly if the disease be due to some irritation in them; in other cases the stools are natural or constipated.

It is often difficult to ascertain the state of the eyes, since attempts to open the eyelids bring on spasms and cause compression of the lids against each other. According to Sir Henry Holland, one of the first symptoms which occurred in cases on the island of Heimaey was strabismus with rolling of the eyes. But this statement must be received with caution, since these cases were not seen by any physician and the information was obtained from the parents and priests. If true, the proximate cause of the disease in Heimaey would seem to be located in the cerebro-spinal axis. Contraction of the pupils commonly occurs in the stage of collapse.

Mode of Death.—Death in infantile tetanus may occur from apnoea in the paroxysms, from extreme congestion of the cerebral vessels, or apoplexy; and, lastly it may occur from exhaustion. The last mode is probably the most frequent.

Prognosis.—All writers till recently agree that tetanus of the infant rarely terminates favorably. Cullen attributes the ignorance of physicians in regard to this disease to the fact that it is so little amenable to treatment that they are not usually summoned to attend those affected with it. In the island of Heimaey, of 185 cases occurring during a series of years about the commencement of the present century, not one survived; and in the same locality, at Westmannoe, a small islet, 64 per cent. of all the infants born died of trismus.² Similar reports in regard to the mortality of tetanus infantum are made by physicians in the Southern States. Dr. H. O. Wooten of Alabama says³ that he has "never seen a decided case of tetanus nascentium that did not prove fatal, . . . and that it is very generally deemed useless to call in medical aid after the initiatory symptoms are well declared." Mr. Maxwell, speaking in reference to the West Indies, says:⁴ "From observations which I have made for a series of years,

¹ *N. O. Med. and Surg. Journ.*, Sept., 1854.

² Report of Dr. Schleisner.

³ *N. O. Med. Journ.*, May, 1846.

⁴ *Jamaica Phys. Journ.*, copied into the *London Lancet*, April 11, 1835.

. . . . I found that the depopulating influence of trismus nascentium was not less than 25 per cent. It scarcely has a parallel within the bills of mortality." Dr. D. B. Nailer¹ says: "About two-thirds of the deaths among the negro children are from this disease, and so uniformly fatal is it that a physician is never sent for."

Yet death does not always result. 8 of the 40 cases in my collection recovered; but a correct opinion cannot be formed from this of the actual ratio of favorable to unfavorable cases, since favorable cases are much more likely to be published. In the history of these 8 cases two interesting facts were noticed, which when present may serve as a ground for hope of a successful termination. These were the age at which the disease began and fluctuation in the symptoms. With two exceptions the infants which recovered were about a week old when the initiatory symptoms appeared, and there were fluctuations in the gravity of the symptoms, whereas fatal cases ordinarily grow progressively worse. Yet in favorable cases the symptoms are never so severe as they become in a few hours in those who succumb.

Duration in Fatal Cases.—Of 18 cases observed by Finckh in the Stuttgart hospital, 15 died in 2 days, 2 in five days, and 1 in seven days. During the epidemic in the Stockholm hospitals in 1834, where 42 cases were treated, the disease seldom lasted more than two days. Romberg says: "It generally lasts from two to four days, but its duration is at times limited at from eight to twenty-four hours, and occasionally, though rarely, it extends from five to nine days."

In 31 fatal cases in my collection, in which the duration is mentioned,

1 lived	3 hours.
11 others lived	1 day or less.
12 lived	2 days.
4 lived	3 days.
3 lived	4 days.

Both Underwood, who published a treatise on the diseases of children in 1789, and Dr. Elsässer, at a more recent date, record fatal cases which were unusually protracted. The one described by Underwood was treated in the British Lying-in Hospital, and, although all the others treated in this institution died by the third day, this lived six weeks; but it is suggested by the author that death was due in part to some other affection. The child treated by Elsässer lived thirty-one days.

Duration in Favorable Cases.—In the 8 favorable cases in my collection the duration of the disease, reckoned from the time when the

¹ *N. O. Med Journ.*, Nov., 1846.

infant ceased nursing till it began again, was as follows: In 1 case two days; in 1, a few days; in 1, fourteen days; in 2, fifteen days; in 1, twenty-eight days; in 1, twenty-one days; and in the remaining case, about five weeks.

Diagnosis.—To one who has seen tetanus of the newly-born or is familiar with its symptoms diagnosis is easy. The symptoms which possess diagnostic value are more manifest and reliable than in most other infantile maladies. Permanent rigidity of the voluntary muscles, with temporary exacerbations, such as have been described above, which are induced by any cause which disturbs the infant, as attempts to open the mouth or eyelids, is pathognomonic.

Preventive Treatment.—While tetanus infantum, if fully developed, is ordinarily fatal in spite of any remedial measures heretofore used, there is no doubt of the efficacy and value of preventive measures when properly employed. This was shown by the great reduction in mortality in the Dublin Lying-in Hospital through the thorough ventilation introduced by Dr. Clarke. Dr. Meriwether of Montgomery, Ala., says: ¹ “When the disease appears endemically on a plantation it may be arrested by having the negro houses whitewashed with lime inside and out; by raising the floors above the ground; by removing all filth from under and about the houses; by particular attention to cleanliness in the bedding and clothes of the mother and in the dressing of the child, so as to prevent any of the matter from the umbilicus lying long in contact with the skin.” Many physicians, especially in the Southern States, speak confidently of care in dressing the cord and attention to the umbilicus as a means of prevention. In the *N. O. Med. and Surg. Journ.*, July, 1853, Dr. Grafton says that he has “never known the disease to occur in any child whose navel had the turpentine dressing.” He uses turpentine as follows: “At the first time a few drops of the undiluted turpentine are applied immediately to the umbilicus around the cord, and it is anointed at every succeeding dressing, the turpentine being diluted one-half or two-thirds with olive oil, lard, or fresh butter.” This use of turpentine has also been recommended by other practitioners in the warm regions.

Dr. John Furlonge of St. John's, Antigua, believes ² that no case would occur with the following treatment: “The cord, when divided, should be wrapped in clean linen. Every night for two weeks one or two drops of tinct. opii and spts. vini, equal parts, should be given, and castor oil, with a little magnesia, every morning. The child must be washed in tepid water every morning, and the funis dressed.” If this treatment be attended by the success which is claimed for it by Dr. Furlonge, so great care in dressing the cord is certainly well repaid in

¹ *Amer. Journ. of Med. Sci.*, April, 1854.

² *Edin. Med. and Surg. Journ.*, Jan., 1830.

localities, as at Antigua, where a large proportion of the infants die of tetanus.

Probably the inflammations located at the umbilicus which have a causal relation to tetanus are septic, due to pathogenic microbes and the ptomaines which they produce. Evidently, to prevent septic poisoning and the consequent tetanus antiseptic dressing of the cord and umbilicus is required. The dusting of a powder of starch and iodoform or starch and salicylic acid in and around the umbilical fossa three or four times daily would probably sufficiently protect the umbilicus from septic infection.

Some experienced observers go so far as to assert that it is possible to ward off tetanus infantum after the occurrence of premonitory symptoms. Dr. Dowell says: ¹ "Some with slight twitchings of the muscles have recovered without any trouble by being put into a mustard-bath, washed clean, and put in a clean and well-ventilated cabin."

Treatment.—In considering the effect of medicinal agents which have been employed in the treatment of infantile tetanus the great difficulty which the child experiences in swallowing should be borne in mind. Without care a considerable part of the dose is lost by the spasm of the muscles of deglutition which ordinarily occurs when the spoon is placed in the mouth, so that, unless special attention be given to this matter, it is uncertain whether the prescribed dose is fully administered.

The treatment employed by different physicians has been very diverse. Antiphlogistic remedies were prescribed by Finckh, but every case so treated was fatal. He states that whenever blood was abstracted, even in small quantities, the symptoms were aggravated. The same result has followed depletory measures in the practice of other physicians.

The internal remedies which have been most frequently prescribed are opiates and antispasmodics. Furlonge in a favorable case gave laudanum in doses of one drop every three hours, alternately with two grains of Dover's powder. Woodworth also gave one-drop doses of laudanum; Eberle, one-sixth of a drop hourly. The opiate has generally been given in combination with an antispasmodic. The Dover's powder given every three hours by Furlonge was combined with five grains of sulphate of zinc. The hourly doses of laudanum by Eberle were combined with six drops of tincture of assafoetida.

When anesthetics began to be employed in the treatment of diseases, it was believed that they would be especially useful in cases of tetanus. Accordingly, chloroform has been used in tetanus in the infant, with the effect of controlling the spasm during the time of its use, but without curing the disease. In Case 7 in our first table it was employed several times, but apparently without delaying the fatal result. The

¹ *Amer. Journ. of Med. Sci.*, January, 1863.

editor of the *New Orleans Medical and Surgical Journal* states, in the May issue of that periodical for 1853, that he has used chloroform in tetanus infantum, with the effect, he believes, of prolonging life. Anæsthetics certainly relieve the suffering of the infant, and on this account, even if they do not prolong life, their judicious employment seems proper.

The remedy which, in my opinion, is far preferable to all others is hydrate of chloral. Since the introduction of this agent into therapeutics it has been employed by several physicians in the treatment of this disease, with so good a result that it will probably supersede all other medicines for this purpose. Dr. Widerhofer of Vienna states that he has saved 6 out of 10 or 12 by the use of chloral.¹ He prescribes it in doses of one to two grains by the mouth, or if there be great difficulty in swallowing two or four grains by the rectum. Dr. F. Anchen-thales relates a case² in which he gave even six-grain doses, and in nine days the disease had entirely disappeared. I have recently employed hydrate of chloral in a case of tetanus, giving it in half-grain doses every two hours, except when there was profound sleep. The disease was fully developed and the symptoms severe when I was called. I did not believe that the infant with the old remedies would live more than two days, but by the chloral life was prolonged nearly one week. Moreover, by the use of chloral the suffering of the infant is greatly diminished. The frequent inhalation of sulphuric ether also aids materially in controlling the spasms.

Dr. Deghilage employed ether and chloral per rectum in a case of tetanus neonatorum, and the child rapidly grew worse, so as to appear in danger of immediate death. He then used ether by inhalation, and artificial respiration was employed from time to time by means of a tube inserted into the nostrils. Pieces of mustard-leaves were also applied to the chest, and the child was laid on its side. In a few hours the patient's condition improved markedly. Profuse perspiration occurred, and the spasms entirely ceased and convalescence occurred.³

The administration of alcoholic stimulants is required at short intervals on account of the rapid emaciation and great prostration.

Local treatment directed to the umbilicus in those cases in which there is evidence of inflammation of the umbilicus or umbilical vessels should not be neglected. The application of an emollient poultice to the umbilicus has been followed by apparent improvement, if we may believe the statement of some physicians who have made use of this treatment. Dr. Meriwether of Alabama says that if there be no improvement from the medicine which he orders he applies a blister, larger than a dollar, to the umbilicus, and with this treatment the child

¹ *London Lancet*, March 18, 1871.

² *Jahrb. f. Kinderheil.*, N. S. iv.

³ *London Lancet*, Sept. 24, 1887.

generally improves—a remarkable statement, since so few improve at all.

A warm foot-bath, repeated at intervals of a few hours, and stimulating embrocations along the spine, are proper adjuvants to the treatment.

CONJUNCTIVITIS (*Ophthalmia Neonatorum* ; *Purulent Conjunctivitis* of the Newly-born).—Different forms of conjunctival inflammation occur in the newly-born. In the mildest variety no appreciable swelling of the lids occurs, and only a little viscid secretion collects between the lids, which agglutinates them in sleep, and which the nurse readily removes by bathing them with tepid water or milk and water, and in a few days effects a cure. On the other hand, the purulent form of conjunctivitis, which is observed on the second or third day after birth, and which arises from the reception between the lids of the vaginal secretion of the mother, always involves great danger to the eye, speedily producing opacity or destruction of the cornea, unless promptly and properly treated. Between these two extremes conjunctivitis neonatorum occurs in different grades of severity.

Mild or Catarrhal Conjunctivitis.—This, as the name indicates, is a simple catarrh, attended, as stated above, by a slight viscid secretion from the lids and by little or no swelling. The secretion collects in the angles of the lids and along their margin. This mild conjunctivitis requires very simple treatment. Warm water or milk and water should be gently applied by a large camel's-hair pencil, so as to wash away the secretion as soon as it forms, and sweet oil or vaseline applied between the lids. With these simple measures this mild conjunctivitis disappears in a few days.

If the secretion be more abundant and the lids perceptibly swollen, more active measures are required. Prof. Noyes states that there is a variety of catarrhal ophthalmia neonatorum which requires active treatment. In the cases alluded to the ocular surface is but slightly involved, having little or no hyperæmia, but the palpebral conjunctiva is hyperæmic and the fornix thickened and swollen. The swelling of the fornix is the most marked anatomical character. The secretion has a watery appearance, and the lids are but slightly tumefied. The cornea does not become hazy and the sight is not impaired, but the watery discharge and the viscid secretion on the borders of the lids continue for weeks, unless the case be promptly attended to. Prof. Noyes recommends for this form of catarrhal ophthalmia neonatorum the application several times daily of the borie-acid solution :

R̄. Acidi boriei,	gr. xv ;
• Aquæ,	ʒj. M.

He adds: "But if a child is a month old and the discharge continue, and the fornix exhibit decided swelling, I have been obliged to use solutions of tannin and glycerin as strong as ℥ij. ad 3j. before the condition would yield. I had tried nitrate of silver in mild solution, and, unwilling to make it more caustic, had taken a solution of tannin gr. x, ad glycerini 3j, but this had only a temporary good effect, and the disease was not subdued until the strong solution was applied. It was done every second day to the everted lid, and was of course quite painful."

Purulent Ophthalmia Neonatorum; Gonorrhœal Ophthalmia Neonatorum.—This is one of the most important diseases to which the neonati are liable, since, if not promptly and properly treated, it is very destructive to the eye, permanently impairing or totally destroying vision. It is produced by the lodgment in the eye of irritating matter, usually the gonorrhœal vaginal secretion of the mother. A minute amount of the virulent matter is sufficient to set up the inflammation. Recent observations seem to show that in a considerable number of cases the poisonous matter is received, not during birth, but in the washing, or subsequently from the fingers of the nurse or mother, or through the medium of soiled towels or linen. Dr. Joseph A. Andrews in an interesting paper on contagious eye disease published in the *New York Medical Journal*, 1855, quotes the following table from Theremin, showing the time of commencement in 476 cases, as follows:

First to fourth day after birth	57 cases.
Fourth to eighth day after birth	134 "
Eighth to fourteenth day after birth	94 "
Later	194 "

When the disease begins subsequently to the first week after birth, it is evident that the infection occurs after birth, the poison being conveyed to the eyes through the soiled fingers or sponges or cloths employed in the nursery, as stated above.

The infectious principle contained in the gonorrhœal discharge of the mother is now admitted to be a micro-organism, designated the gonococcus, discovered and described by Hallier in 1869 and Salisbury in 1873. The attention of the profession was especially drawn to it by Herr Neisser of Breslau in 1879, whose description of it was more full and accurate than that of his predecessors. Recently it has been carefully examined with the aid of coloring tests by C. W. Allen and E. C. Wendt of New York City, and their monograph relating to it is one of the best yet published. The gonococcus is a "comparatively large" microscopic organism, round at first, but becoming elongated or oval, and then dividing by fission so as to become a diplococcus. Subsequently division in the opposite direction occurs, and this process con-

tinnes until the pus-cell in which the gonococci lie is filled with these organisms. It is within the pus-cells, as we have stated, and not on their exterior, that the segmentation and development of the gonococcus take place; but diplococci may be observed in the intercellular fluid, probably having escaped from the pus-cells.

In acute gonorrhœa usually no other or but few other bacteria except the gonococcus are observed; but in chronic gonorrhœa of both sexes other microbes are commonly present in addition to the gonococcus. That the contagious and virulent property of gonorrhœal pus is due to the gonococcus seems to be fully established, but were the action of this organism limited to cases of gonorrhœa it would be less important as a pathological factor. Microscopic examinations show its presence in the pus of ophthalmia neonatorum, as well as in the vulvitis of childhood, when of gonorrhœal origin, and the intense inflammation and rapid destruction of sight in the former disease are believed to be due entirely to its agency.

Dr. Gayet, professor of ophthalmic surgery, Lyons, France, says that the detection of the gonococcus in infected pus is as simple and easy as that of albumen in albuminuria. He places a particle of pus on a glass slide, covers it by another slide, and presses the two together. They are then separated, and stained by dropping on them an alcoholic solution of methyl-blue mixed with an equal quantity of water. After two minutes the slides are washed freely with water, and each leucocyte is seen to have two, three, or four nuclei, "this being a special character of the disease, the increase in the number of nuclei heralding the approach of the gonococci, which will be observed as intensely blue spherical bodies in the interior of some of the leucocytes."¹ If the gonococcus be found in a single leucocyte, of course the diagnosis is established.

Symptoms.—Stellwag says: "The period of incubation after successful inoculation of the contagious material varies between some hours and days. The outbreak of the blenorrhœa follows the more quickly the more favorable are the conditions for the inoculation—*i. e.* the more powerfully the secretion was able to act." In most instances when infection occurs during birth some evidence of the disease appears as early as the second or third day. The inflammation is from the first severe. The conjunctiva, ocular and palpebral, is intensely hyperæmic; chemosis soon occurs in most instances, and an abundant muco-purulent or purulent secretion flows between the lids mixed with tears. The inflammatory hyperæmia not only extends over the entire conjunctiva, but also to the connective tissue and the integument of the lids, causing in the latter a dusky or bluish-red tint. At a later stage the tint may be yellowish-red. The eyelids swell rapidly in consequence of the

¹ *La Province médicale*; *Lond. Lanc.*, June 18, 1887.

looseness of their connective tissue and the great amount of infiltration, so that they appear as projecting tumors pressing against each other and upon the eye, concealing the latter from view. The ocular conjunctiva, from the great amount of serous exudation underneath, rises up like a circular wall around the cornea, which appears sunken in the centre of the swelling, and sometimes only its central part is visible in consequence of the bulging of the swollen conjunctiva over it. The palpebral conjunctiva is so swollen from the serous infiltration that it bulges forward on attempting to separate the lids, and eversion of them is liable to occur. From the great amount of tumefaction of the lids the palpebral fissure is closed, and the upper lid may project over the lower so as to nearly cover it.

The danger to the eye results chiefly from the chemosis, or hard and tense œdema, of the subconjunctival areolar tissue, which by its pressure may obstruct circulation. The eye is photophobic, tender to the touch, and the seat of severe pain. The intensity of the inflammation gives rise to active fever. The inflammation, having reached its maximum, soon begins to abate under correct treatment; the bright-red erysipelatous hue of the lids changes to a bluish color; the heat and tenderness abate. The secretion is abundant, and is constantly escaping from the conjunctival sac and flowing over the cheek, which is often reddened in consequence of its extreme acridity. If in the height of the inflammation we attempt to separate the lids, which are firmly pressed together not only in consequence of the great amount of tumefaction, but also from the spasmodic contraction of the orbicularis palpebrarum, the purulent secretion gushes forth, consisting of greenish or grayish pus—a thick liquid containing flocculi of epithelial cells and muco-pus. Occasionally, when the inflammation is intense, these flocculi contain also fibrin. The discharge, consisting chiefly of muco-pus mixed with tears, has a creamy appearance, but if the lachrymation be abundant it may resemble whey in color and consistence, especially in the declining stage.

Course ; Results.—Purulent conjunctivitis of the newborn usually begins in one eye, and unless the sound eye be immediately and efficiently protected, the inflammation ordinarily soon attacks this eye. Of course both eyes may be simultaneously affected, but in a large proportion of patients there is an interval of a day or two in the commencement of the inflammation in the two eyes, that secondarily infected receiving the virus from the one first attacked.

In the milder cases the inflammatory symptoms, the hyperæmia, tumefaction, heat, and secretion increase gradually, and it is not until the fifth or sixth day that they attain their maximum. In severe cases the symptoms reach their height by the close of the second or third day. The inflammation having attained its maximum, as indicated by

the heat, swelling, and abundant secretion which wells up between the lids, soon begins to abate under correct treatment. But several weeks elapse before the normal state is restored, a simple catarrhal inflammation continuing after the purulent and infective secretion has ceased.

The danger to the eye depends upon the severity of the inflammation. If the chemosis be not great, and the swelling be more œdematous than indurated, and the amount of secretion moderate, the eye is usually saved by timely and correct treatment. In severe inflammation characterized by great chemosis, hyperæmia, and heat, and an abundant purulent discharge, the peril to the eye is imminent, since the inflammation is likely to extend from the conjunctiva to the cornea, and ulceration result. When the cornea becomes cloudy in places the danger to the eye is extreme, but the sight may be preserved, though abscesses and ulcers occur, provided that they are small and involve only a part of the cornea. Abscesses and ulcers near the margin of the cornea are less dangerous than those in the centre, but crescentic peripheral ulcers are of bad import, since they are likely to increase. If marginal softening and a central abscess or ulcer coexist, the sight will probably be lost. Of course the more quickly the inflammation is subdued the better the prognosis.

Preventive Measures.—Since purulent conjunctivitis of the newborn is so rapid in its progress and so destructive to the eye, it is very important that its occurrence should so far as possible be prevented, and, fortunately, it is a preventible disease. The employment of efficient preventive measures is one of the recent achievements in midwifery practice. Statistics abundantly show the need and efficiency of such measures. At the meeting of the Blind Congress, held in Paris in 1879, F. Dumas stated that of 1178 blind patients whom he had treated, 1070 became blind from curable diseases, and of this number 817, or 69 per cent., lost their sight from ophthalmia neonatorum.

According to Horner, of the blind children treated in the institutions of Germany and Austria, from 20 to 79 per cent. lost their sight from this disease.¹ This was before the efficient prophylactic measures now in use were employed.

Inasmuch as this malady is produced by the infective vaginal secretion of the mother coming in contact with the eye of the infant at birth, the use by the mother of antiseptic and disinfectant vaginal douches before and during parturition is suggested as the appropriate preventive treatment in case she have a muco-purulent discharge. For this purpose carbolyzed vaginal injections have been employed, with the result of diminishing the number of cases of ophthalmia neonatorum. Mules² advises the following very judicious and important preventive measures: "1st. Cure all cases of chronic vaginal discharge before labor. 2d.

¹ *Archiv für Gynäkologie*, 1883.

² Prize Essay, *Manchester Chronicle*, Jan., 1888.

Irrigation of the vagina during the second stage of labor when vaginitis is known to exist. The solution used for this purpose in Queen Charlotte's Hospital is corrosive sublimate (1 : 2000). The copious secretion of a clear vaginal fluid before and during labor, and the flow of the liquor amnii just before the birth, diminish the danger. 3d. Assist the foetal eyes to pass beyond the perineal edge without resting. This is easily done by hooking around the perineal edge with the fingers and drawing it down. 4th. By wiping the eyes with a clean cloth at birth of head. 5th. By instilling an antiseptic solution into the eyes at birth if the mother has a discharge. 6th. Credé's method : to wash the face first ; never in water in which the body has been washed. 7th. To retain one sponge or flannel specially for the child's face, and insist on scrupulous cleanliness. 8th. The nurse to wash her hands after adjusting the mother before touching the child. 9th. Not to expose child unduly to draughts, bright light, etc. 10th. To protect the child from flies with a thin veil. 11th. To remove carefully the child from the presence of another similarly affected ; strict isolation of an infected case. 12th. To guard the one eye if the other is affected. The 10th and 11th rules are evidently applicable to cases in maternity wards, rather than to those in private practice.

But in order to gain the highest degree of success by preventive measures it has been found necessary to treat the eyes of the infant immediately after birth if there be the least reason to suspect the presence of an infective vaginal discharge in the mother, so as to destroy the poison if it have lodged in them. In the lying-in asylums where, in consequence of the prevalence of gonorrhœa in the mothers, ophthalmia neonatorum of a severe form has been prevalent, antiseptic treatment of the eyes of all the newly-born has either entirely prevented this disease or rendered it of rare occurrence. To Credé of Leipzig more than to any other physician the credit belongs of having established this treatment. Its efficacy is now universally recognized.

Bathing the eyes of infants immediately after birth was previously practiced by Abegg, who employed only water, and by Olshausen, who, through Von Graefe's advice, employed a 1 per cent. solution of carbolic acid. Although this treatment diminished the number of cases of ophthalmia, it was far surpassed in efficiency by that recommended by Credé, who in 1880 began to treat the eyes of the newly-born in the following manner : The external surface of the lids was first washed with plain water ; the lids were then separated, and a single drop of a 2 per cent. solution of nitrate of silver was allowed to fall upon the cornea from the end of a glass rod. From 1880 to April 1, 1883, Credé treated 1160 infants in this way, and only 4 became affected with ophthalmia neonatorum. This treatment by nitrate of silver, employed in other institutions in Europe and in this country,

has been followed by signal success. Thus, Dr. Garrigues of New York employed Credé's treatment in the Maternity Hospital on Blackwell's Island, where ophthalmia neonatorum had previously been of common occurrence, and of 351 infants born consecutively "not a single one was affected."¹ Dr. Garrigues adds that in these cases occasionally a thin discharge like serum followed the application of nitrate of silver, due apparently to its irritating action, and that the first cases in which he observed this discharge he treated with iced compresses and the instillation of a saturated solution of boric acid. But afterward he found that they quickly recovered without such measures. Occasionally so many drops of the nitrate were inserted by accident that a black ring was produced upon the eyelids, without any ill effect to the eye. Dr. Garrigues recommends Credé's method of employing a glass rod, to which a single drop of the solution adheres, so that there is no risk that more than this amount will be instilled. The application should be made as soon as the infant is removed from the bed to the lap of the nurse. She should first clean the eyelids and the face, and in washing them should be careful that none of the wash enters the eyes. A weaker solution of nitrate of silver has been employed without the good results which follow the use of the 2 per cent. solution. Credé made tentative use of borate of sodium (1 : 60), and found it greatly inferior as a preventive to the nitrate of silver.²

Of course preventive treatment of this kind should not be recommended in general midwifery practice, except when there is evidence or strong suspicion that the mother has gonorrhœa. Moreover, much can be done toward diminishing the number of cases of blindness resulting from ophthalmia neonatorum by disseminating among the masses a knowledge of the imminent danger to the sight of the newly-born infant when a purulent discharge occurs from its eyes, so that instead of employing domestic remedies the parents will seek at once the advice of the accoucheur or family physician.

Treatment.—No disease of early life so imperatively requires early, persistent, and correct treatment as the purulent form of ophthalmia neonatorum. If proper measures be employed sufficiently early and persistently, the eye can nearly always be saved. Since this malady has a microbic origin, it is evident that an efficient germicide is required in the treatment—an agent that does not injure the eye, while it destroys the cause of the inflammation. Various germicides have been employed for this purpose, but the two which have been found safest and at the same time most efficient are corrosive sublimate and nitrate of silver.

The late Prof. S. D. Gross long before the microbic causation of the infectious diseases was known, and before antiseptic treatment had

¹ *Amer. Journ. of Med. Sci.*, Oct., 1884.

² *Arch. f. Gynäk.*, xxi. p. 193.

come into use, had in his large clinical experience discovered the efficacy of the corrosive-sublimate treatment. In his *System of Surgery*, published in 1859, he wrote: "In the purulent ophthalmia of infancy I have usually effected excellent and even rapid cures by the injection every few hours of tepid water or milk and water, followed immediately after by a solution of bichloride of mercury, from the eighth to the twelfth of a grain to the ounce of water;" and again he wrote: "The bichloride of mercury is, of all the local remedies that I have ever tried in this affection, the most efficacious in its action, making generally a most rapid and decided impression upon the discharge." Oppenheimer of Heidelberg in his experiments on the gonococcus, which he cultivated in blood-serum, found that corrosive sublimate, 1 : 40,000, retarded its development, and 1 : 20,000 destroyed its vitality.¹ Nitrate of silver was also used in the treatment of purulent ophthalmia neonatorum long before the gonococcus was discovered, and before the need and efficacy of germicide remedies in the treatment of the infectious diseases were known or recognized. Von Graefe more than thirty years ago everted the lids when it was possible, applied the mitigated stick of nitrate of silver to the mucous surface, washed it with salt, and replaced the lids. This treatment is still employed by some specialists in ophthalmic practice. Dr. Gayet² everts the lids so as to stretch the mucous membrane, when he thoroughly washes the folds of the conjunctival sac by means of a ball syringe. The lids are replaced, rubbed so as to displace pus-cells and force them into the conjunctival sac, again everted and syringed. The mitigated stick is then applied to the palpebral mucous membrane, and the nitrate of silver immediately neutralized and washed away by a solution of chloride of sodium. The lids are then replaced. In the subsequent treatment the mother or nurse washes the eye with a solution of corrosive sublimate (1 : 6000), and frequently renews upon the lids compresses wet with ice-water. But most of the leading oculists employ nitrate of silver in solution in the manner presently to be described.

We again call attention to the necessity in this disease, more than in almost any other, of employing faithful and attentive nurses, who will carry out punctually the directions given. Two nurses are required—one to serve by day and the other by night—since it is essential that the eye be frequently cleaned and the secretion washed away.

If the conjunctivitis be purulent, but mild, and attended by a slight discharge and little or no appreciable swelling of the conjunctiva, two drops of a 2 per cent. solution of nitrate of silver should be instilled

¹ Andrews: *N. Y. Med. Journ.*, Sept. 25, 1886.

² *La Province médicale*, *London Lancet*, June 18, 1887.

once between the lids, and the lids moved to ensure its flowing underneath them :

Ry. Argent. nitrat.,	gr. vj ;
Aq. destillat.,	ʒv. M.

In the subsequent treatment a strong solution of boric acid—some recommend a saturated solution—should be instilled every half hour, the lids being drawn widely apart. The frequent wide separation of the lids, which can be accomplished without undue pressure upon the eye, is useful in allowing the pus to escape, as well as in facilitating the application of the wash. I prefer, however, unless the disease yields quickly, the use of a weak solution of corrosive sublimate in place of the boric acid, employing the following formula :

Ry. Hydrarg. chlor. corros.,	gr. j-ij ;
Aquæ destillat.,	Oj. M.

The use of this mild solution of the sublimate every second hour after a single employment of the nitrate of silver usually suffices to cure mild cases in a few days.

If the disease be more severe, but still mild, and accompanied by moderate tumefaction and a moderately increased secretion, a single daily application of the nitrate of silver suffices during the active period of the inflammation. In severe forms of the disease, accompanied by much tumefaction and the frequent gushing out between the lids of a thick, purulent secretion, the nitrate-of-silver solution should be used as often as every six hours. Dr. David Webster of the Manhattan Eye and Ear Hospital states that he has employed the nitrate of silver in these severe cases five times in twenty-four hours with great benefit. As regards the frequency of the application of nitrate of silver, and the time when to desist from its use, Andrews writes: "The only guide which I know is the condition of the conjunctiva. When there is slight hyperæmia only, the slough produced by the nitrate of silver requires a long time to be cast off," and it is very irritating. But if there be a more severe inflammation, with much swelling, the slough is thrown off in a few hours. The use, therefore, of nitrate of silver at intervals of a few hours should be practised only in the most severe forms of the inflammation, while in the milder cases it should be used only once or at long intervals. In the declining period of the disease the application of a solution of boric acid or a weak solution of corrosive sublimate, gr. 1 to the pint of distilled water, suffices to effect a cure.

ICTERUS NEONATORUM.—Icterus, or a yellowish discoloration of the skin, is common in the newly-born. It has even been said that in

its mildest form it is present in the majority of infants, and it arises from a considerable number of anatomical and pathological conditions. It occurs in its worst and most intractable form when there is congenital obliteration of the bile-ducts; it is believed to occur sometimes in the youngest infant from the same cause as that which produces the usual form of adult jaundice—to wit, catarrh of the duodenum extending by propagation into the bile-ducts and narrowing or occluding their lumina. Congenital syphilis is another cause, the icterus being probably produced by the newly-formed connective tissue which compresses the bile-ducts. The *modus operandi* of the causes related above is easily understood, but a large proportion of the neonati who have the icteric hue in a slight or mild form do not appear sick, and fully recover after a few days. The cause in such cases is probably of a trivial nature, else it would produce a more profound impression on the system. West says of these mild cases in which there is no appreciable impairment of the health that the yellow tinge of the skin comes on about the third day, deepens for a day or two, and subsides gradually, “the bowels acting properly and the urine not being high-colored: though to this condition the name of jaundice has been applied, it is yet no real jaundice, but is merely the result of the changes which the blood in the over-congested skin is undergoing, the redness fading, as bruises fade, through shades of yellow into the genuine flesh color.” A yellow coloring of the skin, the result of cutaneous hyperæmia, is not accompanied by the diagnostic signs of true jaundice, such as a yellow conjunctiva, clay-colored stools, and biliary coloring-matter in the urine. Inasmuch as the liver and other internal organs are not concerned in producing this form of icterus, West says it has been proposed to designate it by the term “local icterus.” It would be interesting to ascertain in cases in which there is a deposit of pigment in the skin, while all the other organs, including the liver, are in their normal state and have their normal functional activity, whether there has been a cutaneous plethora due to late ligature of the cord. Zweifel states that the placenta before the uterus contracts after the expulsion of the child, and the cord is still beating, contains six ounces of blood, but if the cord have ceased to beat and the uterus be firmly contracted, half of this amount of blood, or three ounces, passes through the cord and augments to this extent the quantity of blood in the vessels of the fetus. Late ligature, therefore, when there is firm uterine contraction, increases the fulness of the blood-vessels in the child, and, according to Park, babies with distended blood-vessels exhibit a more intense jaundice.

H. Quinke advances another and in some respects a plausible theory of the etiology of the common form of icterus neonatorum.¹ He attributes

¹ *Archiv für experimentelle Pathologie und Pharmakologie*, xix. 1 and 2.

the jaundice to the continued patency of the ductus venosus. Henry Ashby says¹ that in a minority of cases of jaundice of the newborn the clinical history or post-mortem examinations reveal the cause, as when it arises from congenital defects, syphilitic hepatitis or cirrhosis, septicaemia or hæmaglobinuria. But the usual form of infantile jaundice, which begins on the second or third day, and commonly ends favorably, Ashby states, has nothing in common with the above fatal forms. He does not accept West's and Murchison's theory of a merely cutaneous icterus, and believes that Quinke's theory is the most plausible yet presented for consideration. The ductus venosus normally closes between the second and fifth days after birth, but if it remain pervious and the circulation from any cause be retarded, bile, according to the above theory, enters the branches of the portal vein and finds its way into the general circulation through the ductus venosus. In one case, says Ashby, an infant had jaundice from the second to the eleventh day, and at the autopsy the ductus venosus was large enough to admit an ordinary director. This theory also comports with the fact that feeble infants are more liable to become jaundiced than the robust, for those vascular canals which pertain to the foetal state and are obliterated after birth are more likely to remain a longer time pervious in the feeble than the robust.

Dr. Alois Epstein² made many experiments in order to determine whether bile-pigment occurs in the urine of icteric newly-born infants. He agitated the urine with lime-water, filtered it with alcohol, and added sulphuric acid. If bile-pigment be present a green color results. He discovered in the urine a pigment in the crystalline or amorphous state, and of a yellow or yellowish-red color. It occurred in the various forms of tufted needles or small tables, yellowish or brownish, and in yellowish-red amorphous granulations. Epstein was able to distinguish by chemical reactions this pigment from uric acid and the nrates. On further investigation he states that he found this pigment in all the organs, abundantly in the kidneys, and also in the blood. Does this pigment have an hepatic or hæmic origin? Epstein is led by his investigations to believe that this crystalline or amorphous pigment results from changes occurring in the blood, and probably from the liberation of the coloring matter by the destruction of the red corpuscles, which Neumann, Kölliker, Denis, Hayem, and others have shown to occur so abundantly in the neonati.

Epstein believes that any marked impairment of the important functions in the system tends to increase the destruction of the red corpuscles, the consequent release of its coloring matter, and the formation

¹ *Lond. Med. Times and Gaz.*, April 25, 1885.

² "Ueber die Gelbsucht bei Neugeborenen Kindern," *Sammlung klinischer Vorträge*, No. 80, 1880.

of the crystalline or amorphous pigment described above, which in icterus escapes into the tissues. Marked impairment of respiration, circulation, and calorification, artificial alimentation, prematurity, protracted and difficult birth, taking cold, and similar agencies, in proportion as they impair the general health and produce perturbation in the system, increase the destruction of red corpuscles, and thereby act as causes of icterus. Epstein also mentions the well-known fact that the children of parents who have grave constitutional diseases or live under bad hygienic conditions are especially liable to become icteric, and that septic infection is an important cause of those alterations in the blood which give rise to icterus.

The peculiar character of the blood of the newly-born is believed by good observers who have investigated this subject to predispose to the occurrence of jaundice. According to Hofmeier, the red blood-corpuscles in the neonati are more spherical than in adults, and do not show a tendency to form rouleaux. The white corpuscles are often more numerous than in adults; they are viscid, deliquescent, easily destroyed, and have a tendency to aggregate in rouleaux. The investigations of Ponfick and Silbermann¹ show that the red corpuscles of the newborn readily part with their coloring matter, the hæmaglobin, under disturbing agencies, such as syphilis, burns, taking cold, injudicious nursery management, and even by the action of certain medicinal agents, as glycerin and pyrogallie acid. The red corpuscles, which have lost their coloring matter by its transference to the plasma, either disintegrate and disappear, or they appear under the microscope as pale rings which have been designated shadows. This transference of the coloring matter from the red corpuscles to the liquor sanguinis, and the disintegration of red corpuscles, which characterize the first few days of infant life, lead to an increase of hæmaglobin in the plasma (hæmaglobinæmia) and of fibrin ferment. Silbermann summarizes his views, derived from an examination of the character of the blood and the blood-changes occurring in the newly-born, as follows: "The blood of the newly-born holds corpuscles which vary greatly in size, and also the so-called shadows: it is richer in fibrin ferment than the blood of adults; these peculiarities are due to the liberation of hæmaglobin and its transfer into the plasma; the richness in fibrin ferment of the blood of the newly-born predisposes to disease; all disease-processes in the newly-born which involve great destruction of the albumen in the circulation are especially dangerous to life." These investigations relating to the blood will aid to an understanding of the views of Silbermann regarding icterus.

Dr. Silbermann concludes² an elaborate paper on icterus neonati

¹ "Zur Hæmatologie der Neugeborenen," *Jahrbuch für Kinderheilkunde*, 1887.

² *Archiv. für Kinderheilkunde*, 1887.

with the following aphorisms: "1st. Icterus of the newly-born is an icterus of absorption. 2d. The biliary engorgement has its seat in the biliary capillaries and the interlobular bile-ducts, which are compressed by the dilated branches of the portal vein and the capillary blood-vessels of the liver. 3d. This engorgement in the vessels is effected by the change in the circulation of the liver which occurs soon after birth, and is one of the indications of a general change in the blood-plasma. 4th. This change, which is induced by the destruction of many blood-corpuscles soon after birth, consists of a kind of blood-fermentation. 5th. The more feeble the infant the more intense will be the icterus, for in such a child the destruction of corpuscles, and the consequent blood-changes, will be much more decided than in a vigorous child. 6th. As the consequence of the destruction of so many red corpuscles there is abundant material for the formation of biliary coloring matter, and under the influence of the fermentation-process alluded to this accumulates in considerable quantity." Therefore, according to this theory, free coloring matter in the blood derived from the abundant destruction of the red corpuscles which attends the first days of infancy, occurs in such quantity that it cannot be disposed of in the biliary secretion or otherwise eliminated, and is deposited in the tissues, causing the icteric hue.

Birch-Hirschfeld¹ attributes icterus of the newborn to œdema of the capsule of Glisson, and consequent compression of the bile-ducts. This œdema he believes is due to diminution of pressure in the portal system consequent on section of the cord.

That feebleness, insanitary conditions, and exposure are a cause of jaundice, however they may act to produce such a result, is shown by many observations. West, as we have stated above, describes a local or cutaneous icterus resulting from plethora of the skin, and having no special interest or importance, and a systemic or general icterus, which he states "does not affect perfectly healthy children who have been born at the full time, have been nourished exclusively at the mother's breast, and been sheltered from cold without being overburdened with clothing or confined in a vitiated atmosphere." In corroboration of this statement he alludes to the fact that in the Dublin Lying-in-Hospital, where the utmost care is bestowed on the foundlings, icterus is rare, while it is so common in the Foundling Hospital of Paris that few escape. In the latter institution, as compared with the former, the exposures are much greater and the conditions as regards hygiene are greatly inferior.

M. Bouchut says that icterus is observed in 80 to 90 per. cent. of the newborn; that Levret, Breschet, Billard, and Valleix regard it as the result of ecchymosis of the skin following congestion—an opinion

¹ *Virchow's Arch.*, 1882, Band lxxxvii.

which he considers erroneous. He believes that it almost always results from a mild or severe hepatitis consequent on ligature of the cord. The ligature, he says, produces a mild inflammation which is propagated to the liver and causes obstruction of the bile-ducts. In his articles on hepatitis of the newborn he repeats his belief in this theory.

The obvious inference from the above résumé of opinions is that icterus neonatorum results from different causes in different instances, and that it is a mild or grave disease according to its etiology. The various causes admit of classification in two groups: 1st, the hæmatogenous; 2d, the hepatogenous. The hæmatogenous theory, which attributes the common form of icterus of the newly-born to the destruction of the red blood-corpuscles in the first days of life, and the escape of its coloring matter into the circulation, is advocated by such men as Billard, Virchow, Breschet, Porak, Violet, and Epstein. The hepatogenous theory has also advocates of equal reputation. The etiology of this disease certainly requires further investigation, and when it is better understood it will probably be seen that distinct pathological states in the newly-born have been described under the term "icterus."

Prognosis.—This depends on the nature of the cause as well as the present state of the infant. If the cause be susceptible of removal, as in the common mild form of icterus, a favorable prognosis is justified. The most unfavorable cases are those in which there is absence of the biliary ducts or their permanent occlusion. In severe forms of the disease in which the connective tissue, the secretions, and transuded serum have the yellow hue the prognosis should be guarded.

The common mild form of icterus, appearing on the second or third day after birth, disappears or is scarcely appreciable at the close of the second week. Severe icterus, continuing longer without any abatement in its intensity, is due as a rule to permanent anatomical conditions which prevent the flow of bile into the intestine, and is probably incurable. In these cases the stools remain clay-colored, the icterus increases, and vomiting may occur.

The *treatment* is simple, and to a considerable extent expectant. Gentle friction over the liver may perhaps in some cases aid in removing the obstructive disease in the bile-ducts. The use of hydrarg. cum creta in small doses, as recommended by West, is of doubtful efficacy. It is evident that preventive measures are more important and more efficacious than the curative, since every measure which promotes a healthy parentage and the health and robustness of the infant tends to diminish the frequency of this disease. Those who, like Porak, believe that congestion of the skin at birth is a common cause of the simple form of jaundice recommend an early ligature of the cord, when

the umbilical arteries are still beating or have just ceased to beat, since when the arteries are beating an equilibrium is maintained in the circulation, whereas in a late ligature, when the uterus is firmly contracted and the arteries have for some time ceased to beat, a plethoric state of the vessels is more likely to occur.

UMBILICAL VEGETATIONS.

Not infrequently small excreescences sprout out from the base of the umbilical depression at the time or soon after the fall of the cord. They have the appearance of those vegetations which arise from open sores, and which have been designated, in common parlance, proud flesh. One of the first, if not the first, monograph on these outgrowths appeared in the *Medical Dictionary* in 1834 from the pen of M. Dugès. They have been designated in different languages by many appellations, as fungous exerescence of the umbilicus (Condie), exerescence of the umbilicus (Cooper Foster), warty tumor of the umbilicus (Holmes), bourgeonnement de l'ombilic (Depaul), granulome de l'ombilic (Dechamber), végétation ombilicale (Guersant). Virchow has also alluded to them in his treatise on tumors, and a carefully-prepared and instructive monograph relating to them appeared in the *Rev. Mens. des Malad. de l'Enfance*, Juillet, 1886, from the pen of M. Broussole.

The size attained by these growths is always small. Many of them are not larger than a pea in their greatest development. Their form appears to be determined in a measure by the external pressure. Some are rounded, and others are elongated or cylindrical. French physicians have likened them, as regards appearance, to a small strawberry or a small cherry, and sometimes, when small and elongated, they have been likened in shape to a grain of wheat or barley. Guersant and Owen have described them as having a nipple- or polypus-shape according to variations in their base. It is only in exceptional instances that they have so red a tint as the strawberry or cherry. Their color varies from a pale red to a red of a deeper tinge according to the degree of vascularity, and they are always moist.

This outgrowth is distinguished by its irreducibility and its consistence. Digital pressure may cause it to disappear in the umbilical fossa, but it disappears by depressing the floor of the fossa. It reappears in its entirety by the resiliency of the walls of the fossa as soon as the pressure is removed. It has the soft consistence of fungous tissue, so that it is depressed and flattened and its shape changed even by slight pressure. It arises in most instances from the inferior part or floor of the umbilical fossa, and it contrasts in appearance with the cutaneous folds of the umbilicus by its softness and reddish tinge.

This tumor does not exhibit any tendency to ulceration nor to hemorrhage in the proper sense of the term, but a sanguinolent serum exudes from it and stains the linen unless the growth be small. The thin irritating discharge from the surface or base of the vegetation sometimes causes small excoriations upon the edge of the fossa. In a child of one year and a half, whose case is detailed by Foster, the ulceration from this cause attained considerable size. It is said that cases have been observed in which the redness increased when the infant cried, and other cases in which the vascularity was such that more or less hemorrhage occurred when the tumor was injured. In these last cases umbilical nævi may have been mistaken for vegetations.

Progress.—This vegetation in the first days or weeks increases more rapidly than subsequently. It may attain half the size or the full size of a pea, or even a greater development, by successive sprouting of granulations. It may increase slowly during many weeks or months, or it may come to a standstill and show no tendency to diminish or atrophy. In time, according to several writers, it is likely to shrivel and skin grow over it, and thus be cured. But more frequently surgical interference is required.

Etiology.—It is reasonable to suppose that some excoriation of the surface precedes the granulations, and affords the base on which they arise; but why one child has this outgrowth, while another child, with the same management of the cord and apparently the same condition of the umbilicus, is free from it, does not perhaps admit of explanation.

Diagnosis.—This is readily made. The small size, irreducibility, reddish hue, the serous oozing, which stains the linen yellow, the softness, like exuberant granulations in other localities, and the shape, enable the physician to diagnosticate this growth from any other kind of acquired tumor. An umbilical nævus has greater firmness and a deeper red color, which disappears on pressure and becomes more pronounced when the infant cries. The nævus is also less elevated, and it extends laterally and vertically farther than the vegetation, often passing beyond the umbilicus. From other tumors occurring at the umbilicus, as adenoma and sebaceous and other cysts, the diagnosis is easily made, since tumors other than the vegetations and nævus are covered with skin, are not attended by the serous oozing which stains linen, and most of them are congenital.

Histology.—M. Albarran and others have made microscopic examination of these vegetations, and found that they consisted of frail, feebly-organized connective tissue, round cells with large nuclei, capillaries with walls consisting of swollen endothelial cells, and vessels of larger size with narrow lumina and with walls formed by concentric layers

of flattened fusiform cells. In another case examined microscopically fasciculi crossed each other, forming alveoli which contained cellular elements that were abundant in proportion to the fibrillar stroma. The vegetations always contain numerous small blood-vessels, true embryonic capillaries, with walls consisting of young cells arranged concentrically. They are made up of these small vessels, frail connective-tissue cells, and some granular intercellular substance.

Treatment.—Canterization by nitrate of silver acts slowly, but sometimes destroys the vegetation if small. More efficacious and preferable treatment is to remove the growth by the seissors or ligature. Saint-Germain operates as follows: The fold of the skin surrounding the umbilicus is depressed, while slight traction is made on the exerescence by the forceps. The pedicle is then strongly tied by a silk thread previously dipped in a solution of carbolic acid. Slight traction then suffices to remove the growth, and they sometimes drop off in the tying. After the removal a little iodoform should be dusted into the umbilical fossa, and the umbilicus covered by a pledget of surgeon's lint retained in place by strips of adhesive plaster.

UMBILICAL HEMORRHAGE.

Hemorrhage occurring at birth or soon after from too loose ligation of the cord, or from its laceration, is so well known and its cause so apparent that it need only be alluded to in this connection. Bouchut relates a case in which death took place from this cause even before birth. The child was attached to the placenta by a navel-string so short that it prevented delivery till it parted by the traction of the forceps. The bleeding from the umbilical vessels was so profuse that the child was pallid and lifeless when born.

But another form of umbilical hemorrhage sometimes occurs in the newly-born. The oozing takes place from the umbilicus itself, and not from the loosely-tied or torn umbilical cord. One of the first cases on record of this hemorrhage was published in the *Gentleman's Gazette*, in April, 1752, by Mr. Watts of Kent, England; but after the publication of this case a century elapsed before umbilical hemorrhage attracted the attention which it merited. In April, 1852, Dr. Francis Minot read a paper on this disease, containing the statistics of 46 cases, before the Boston Society for Medical Improvement. Three years subsequently, in 1855, Dr. Stephen Smith of New York read a monograph on the same subject, containing the statistics of 79 cases, before the New York Statistical Society. This was followed in 1858 by a statistical paper from the pen of Dr. J. Foster Jenkins, read before the United States Medical Association and published in its *Transactions* for that year. This monograph was elaborate, since the writer succeeded in obtaining the

histories of 178 cases from medical journals and members of the Association.

Sex; Age.—In the cases collated by Jenkins, $34\frac{1}{4}$ per cent. were females and $65\frac{3}{4}$ per cent. males. However, it seems improbable that sex produces any difference in the liability to umbilical hemorrhage. The following table gives the ages at which the hemorrhage began in 99 cases :

Age.	No.	Age.	No.
On the 1st day	5	8th to 10th day, inclusive	25
" " 2d "	7	11th to 15th " "	16
" " 3d "	6	16th to 21st " "	4
" " 4th "	3	22d to 56th " "	1
5th to 7th day, inclusive	32		99

These statistics are interesting as showing the relation of the hemorrhage to the umbilical cord. In the 18 cases in which the hemorrhage occurred under the age of three days it may be assumed that the cord was attached, and the blood escaped from the walls of the umbilical fossa outside of the line of its attachment. Immediately after the fifth day, or after the time when the cord falls, there was a large increase in the number of cases, so that from the fifth to the fifteenth day after birth was the period of greatest liability to the hemorrhage. Since, as many observations have shown, in a large proportion of cases the blood has feeble coagulability, it seems probable that the umbilical vein and the umbilical and hypogastric arteries may not have been occluded by fibrinous coagula in at least some of these patients, as they commonly are in the healthy, and that the hemorrhage occurred in part from these vessels. This hypothesis is rendered more plausible by the fact that from the general ill-health present in many of these infants, probably the walls of the vein and arteries were lacking in contractility, so that they remained more patulous than in robust and healthy infants.

Causes.—Hemorrhage from the umbilicus, so well as from other parts in the newly-born, must be referred to a faulty composition of the blood, especially its feeble coagulability, or to an abnormal state of the walls of the minute vessels, or to both these causes. The hemorrhage is sometimes referable to the hemorrhagic diathesis or hæmophilia, which may be inherited or may result from obscure causes in children born of healthy parents. In the New York Infant Asylum a well-developed and apparently healthy mulatto woman gave birth to her first infant on Nov. 30, 1886. She stated that her family were healthy and that the father of the child was also in excellent health. The birth was easy and natural, and nothing unusual was observed in the infant, which weighed nearly ten pounds, except a swelling from extravasated blood above and in front of the right ear. At 7 A. M. on the next day

severe umbilical hemorrhage occurred, which was checked by styptics; then slight epistaxis took place. At 11 A. M. bleeding from the navel returned, and appeared to come from several points at the margin of separation of the floor of the umbilicus from the cord. The tumor above the ear increased, purpuric spots appeared upon the integument, and death occurred from exhaustion on December 2d. The infant lost one pound in weight during the two days of its existence. At the autopsy a few small superficial erosions could be made out in the umbilical fossa at the point of union with the cord. The umbilical vein, traced to the liver, and the hypogastric arteries, traced to the iliac arteries, contained no blood, were patulous, and apparently normal. Extravasations of blood were found under the skin, in the abdominal cavity, and at numerous points in the lungs, etc. The organs had an exsanguine appearance, and everywhere the blood was without clots. Its fluidity is to be noted. The cause of the hæmophilia in this child is not apparent. Its parents, so far as could be ascertained, were healthy; still, it may have belonged to a family of bleeders, for the hemorrhagic diathesis sometimes passes over one generation and reappears in its children.

Syphilis is one of the recognized causes of the hemorrhagic diathesis in the newly-born. In 1871, I was requested to visit a neonatus who was a bleeder, whose father had syphilis in an unmistakable form, and whose mother was suspected to have contracted the same from her husband. The child was fairly developed, and the cord separated on the sixth day. A constant oozing of blood from the navel commenced on the seventh day, on account of which I was summoned to the case. I finally succeeded in arresting the bleeding by the application of the plaster-of-Paris dressing, but immediately intestinal hemorrhage commenced, of which the child died in twenty-four hours. The parents were induced to take antisiphilitic remedies for a considerable time, and they have since had four healthy children. In another instance observed by me, an infant, puny and apparently premature, was at birth observed to have several blebs of pemphigus, from which blood soon began to ooze, but the umbilical hemorrhage from which the child died did not begin until about the fourteenth day.

Two elements or factors appear to be present in producing hemorrhagic syphilis in the newly-born. We have already alluded to abnormal fluidity of the blood, for when it escapes it does not coagulate or its coagulation is very inadequate. The other factor is abnormalities in the minute vessels. Many years ago the eminent obstetrician Sir James Y. Simpson of Edinburgh met cases of hemorrhage in the newly-born which he attributed to inflammation of the vessels, arterial or venous, or both, from which the blood escaped. The inflammation, in his opinion, caused thickening and infiltration in the walls of the

vessels, loss of tonicity, and consequently a patulous state. Simpson does not seem to refer in particular to the hemorrhage due to syphilis, but to that from other causes as well. Dr. Mraeck, lecturer on syphilis in the University of Vienna, reported 19 cases of hemorrhagic syphilis in neonati.¹ None of the mothers had undergone antisyphilitic treatment. One of the infants was born dead, while the others lived from half an hour to forty-eight hours. The capillaries, the vasa vasorum, the venules, and arterioles were filled with morbid products, having caused local troubles of circulation and sanguineous effusions.

Among the first to draw attention to hemorrhagic syphilis of the newly-born was Behrends in 1883, whose opinions were based on clinical observations. His views received support and confirmation from cases observed by Kassowitz, Dreahma, and Emilio Schutz. The last physician made careful microscopic examination of the vessels in infants who died of this hemorrhage. Andronico also published an interesting paper on hemorrhagic syphilis of the newly-born.² His observations justify, in his opinion, the statement that hemorrhages in syphilitic neonati are due not only to "diminished power of coagulation of the blood," but to a "vascular ectasis, particularly in the small cutaneous veins."

Widerhofer,³ remarking on hemorrhage in the syphilitic infant, attributes it to the blood dyscrasia.

Bleeding from the navel also sometimes occurs as a symptom or complication of jaundice. Writers who have collected records of this hemorrhage have remarked the frequent occurrence of the icteric hue both before and during the bleeding, even in those who do not present the history of syphilis. It is not improbable that in certain instances the jaundice is hæmatogenous, arising from destruction of the red globules and liberation of the hæmatin—a not unusual result of a profound dyscrasia even when there is no syphilitic taint. In other instances the jaundice proceeds from the liver, and the bleeding occurs from the altered state of the blood, which is produced by abnormalities in the liver or its appendages. Thus in at least five of the cases of umbilical hemorrhage collated by Jenkins the marked jaundice which was present was found to be due to congenital occlusion of the common bile-duct, and of course all the bile secreted which did not remain in the liver entered the blood. The biliary acids in the blood probably diminish the amount of its fibrin and increase its fluidity.

Poor health in the mother and impoverishment of her blood during gestation, whether from chronic disease, as tuberculosis, or antihygienic conditions, also cause impoverishment, and increase the fluidity of the blood, and therefore act to a certain extent as a predisposing, if not as a

¹ *Berlin. klin. Woch.*, No. 46, p. 807, Nov. 15, 1886.

² *Arch. di Pat. Infan.*, July, 1886.

³ *Allgem. Wien. Med. Zeitung*, No. 4, 1883.

direct, cause of the hemorrhage. Some have supposed that the excessive use of diluent drinks or alkalies by the mother during gestation also increases the fluidity of the blood of the fetus and renders it more liable to hemorrhages after its birth.

In exceptional instances no adequate cause of the bleeding can be detected either in the child or the health of its parents. Thus in the *Archives of Pediatrics* for May, 1884, Dr. Seibert relates the case of an infant whose umbilical dressing and clothing were saturated with blood at the twentieth hour after birth. The bleeding was arrested, but it returned, and the child died. No coagula of blood occurred either in the pools or the saturated clothing. There was no history of hæmophilia or syphilis in the parentage or lineage, and the child at birth was plump and apparently healthy, having no petechiæ, pemphigus, jaundice, or ecchymoses. The health of the mother had not, however, been good during gestation.

Ordinarily, umbilical hemorrhage occurs without premonition, but occasionally it is preceded by jaundice. Jaundice was a prodromal symptom in 41 of the 178 cases embraced in Jenkins' statistics, and, besides the icteric hue, constipation, clay-colored stools, deeply-tinged urine, etc. were recorded in some of the cases. Rarely colicky pains and vomiting precede the hemorrhage. The blood oozes slowly or rapidly. It seldom escapes in a jet, even when its color shows that its source is more arterial than venous.

Grandidier collated the histories of 202 cases, and the examination of these enables him to make the following statement: The hemorrhage often begins at night, so that it may continue a considerable time before it is detected. He also states that vomiting, colicky pains, somnolence, and especially icterus, with constipation or clay-colored stools, sometimes occur. In 135 of the cases embraced in Grandidier's statistics the hemorrhage occurred in 38 before the fall of the cord, in 26 at the time of its separation, and in 71 at a later date.

Prognosis.—This is unfavorable. Statistics show that 5 in every 6 perish. The prognosis is most unfavorable when an obvious dyscrasia is present. Those who have jaundice or hæmophilia with very few exceptions survive. Those are most likely to recover who have a healthy parentage, no obvious dyscrasia, and in whom the hemorrhage occurs late and is not profuse. The average duration of the hemorrhage in 82 cases in Jenkins' collection was three and a half days, the minimum being only three hours. Death usually occurs from exhaustion.

Treatment.—A compress of surgeon's lint or a sponge saturated with the liquor ferri subsulphatis should be firmly pressed over the umbilicus and retained by a bandage. If the bleeding do not cease, the umbilicus should be covered by a thick layer of plaster of Paris, supported by

the hand until it hardens, and then retained in place by the bandage passing around the body. In the case related above, occurring in my own practice, this treatment arrested the bleeding from the navel, but it was followed by fatal intestinal hemorrhage. If the hemorrhage continue, the needles with ligature may be employed. Bouchut indeed states that this is the only effectual treatment. Two needles are passed through the umbilicus at right angles, and a waxed thread wound around each in the form of the figure 8. If the patient survive, the needles should be removed in four or five days and iodoform or a poultice applied. It is important, so far as time will permit, to treat the dyscrasia, and a laxative is often indicated, especially if constipation be present. A laxative is useful for its effect on the hepatic circulation and as a derivative. Both Smith and Jenkins recommend calomel for this purpose. During the continuance of the hemorrhage four or five drops of brandy in breast milk frequently administered are useful as a stimulant.

SEPSIS OF THE NEWBORN.¹

The manner in which sepsis or septicæmia occurs is sometimes obscure. Leube in 1878 relates two cases² in which the examination failed to disclose the source or mode of infection. He designates such cases cryptogenetic, expressive of the unknown or occult origin. Wunderlich and Schützenberger allude to similar cases. But in sepsis of the newly-born it is the common and apparently correct belief that the poison of sepsis usually enters the system at the umbilicus. The cases which I am about to relate are in harmony with this theory.

It is not my intention to discuss the nature of the septic poison, but there can be little doubt, from the examinations which were made, that in the following cases it consisted of microbes and the ptomaines or chemical agents produced by microbic action.

Cases of sepsis of the newly-born may be conveniently classified as follows :

FIRST GROUP.—*Cases of umbilical phlegmon, which is a local sepsis, the poison entering the system from an umbilical sore, and being conveyed by the lymphatics.*

The New York Infant Asylum at Sixty-first street and Tenth avenue has, during the twenty-three years of its existence, been remarkably free from contagious and infectious disease, but since September 1, 1887, seven cases, in which either local or systemic sepsis was diagnosed, occurred in newborn infants in the maternity ward of this institution.

¹ Read before the Pediatric Section of the New York Academy of Medicine, *Medical News*, Sept. 8, 1888.

² *Deutsch. Archiv für klin. Med.*

It is proper to state that at the same time diphtheria was epidemic in the asylum, and that five of the newly-born infants had diphtheria, the pseudo-membrane appearing in its usual situation on the pharyngeal, nasal, and laryngo-tracheal surfaces, and, in one or two of the patients, also lining the œsophagus. Moreover, two of the five infants with diphtheria had umbilical phlegmon of a few days' duration when the diphtheritic exudate appeared upon the faucial surface.

The question is therefore a proper one, whether in these two cases the phlegmons were a local manifestation of diphtheria, or whether the umbilical phlegmon and diphtheria were distinct diseases having a different microbial origin.

CASE I.—Victor M — was born, after normal labor, on January 5, 1888, and the umbilicus was dressed with borated cotton. The mother did well, and was able to leave her bed on the seventh or eighth day. Nothing unusual was noticed in the infant until January 11th, when a little suppuration was observed in the umbilical fossa at or around the point of attachment of the cord, and on examination the walls of the umbilicus were found thickened and indurated. The appearance indicated the commencement of an umbilical phlegmon, and the skin covering it was red as in erysipelas. The phlegmon extended in area until January 14th, when the thickening and infiltration reached to the distance of about one and a half inches in every direction from the umbilicus, so that the form of the phlegmon was circular or wheel-shape. Its thickness or depth near the umbilicus was perhaps three-fourths of an inch, but near its margin the thickening and infiltration were less. The pulse on the 13th varied from 132 to 144, and the rectal temperature was 101.8°.

The case was carefully watched by Drs. Davis and Cook, the resident physicians, whose records I employ, and the faucial surface was daily inspected by them. On January 14th, the baby being nine days old, they observed for the first time the grayish-white exudate of diphtheria on each side of the fauces, and a day or two later also upon the Schneiderian surface, so closing the nostrils that respiration through them was impossible. The baby, on attempting to draw the nipple, became cyanotic and was obliged to relinquish its hold. During the 14th and 15th the temperature fell to 98.5° and 98°, the pulse was very feeble and too rapid to be counted accurately, and the respiration varied from 24 to 48. Death occurred on the 15th at the age of ten days.

The autopsy revealed a diphtheritic pseudo-membrane upon the faucial surface on both sides, extending downward, so as to cover both surfaces of the epiglottis, the entrance of the larynx, and the laryngeal surface, completely concealing the vocal cords and the portion of the larynx above them. The trachea and bronchial tubes were free from

the exudate. The lungs in nearly every part were thickly mottled with points of extravasated blood, and less abundant extravasations were observed in and upon other organs. The umbilical phlegmon, removed entire, and in a frozen state from the intensity of the cold in the dead-house, was sent to the laboratory of the College of Physicians and Surgeons, where it was carefully examined by Dr. Prudden. He reports that the umbilical vessels were in their normal state, showing no evidence of disease, except the mouth of the umbilical vein or that portion of the vein which was next to and in immediate relation with the umbilicus. Plugging the mouth of the vein and extending a few lines along the lumen of this vessel was a thrombus or blood-clot, from which Dr. Prudden was able to obtain cultures, and in the culture-bed two forms of cocci were developed—to wit, the *Staphylococcus pyogenes aureus*, occurring in the usual form in groups, and the *Streptococcus pyogenes*, producing beautiful and delicate chains. The portion of the vein enclosing the thrombus or clot had preserved its integrity, so that the clot was entirely distinct from the phlegmon which covered the vein. It did not seem possible that microbes, ptomaines, or elements of the blood could pass from one to the other, on account of the firm coats of the vein which were interposed between them.

Portions of the phlegmon placed in culture media developed the same forms of cocci as those produced from the clot that plugged the mouth of the vein. We infer that the cocci were the septic agents, since no other cause of the sepsis was discovered, and that they were received from the umbilical sore. Some entered the thrombus, and others, taken up by lymphatics, entered the tissues which surrounded the umbilicus and gave rise to the phlegmonous inflammation.

It is easy to understand how micro-organisms may enter the umbilical vein after the fall of the cord, when there may not be complete closure of the mouth of the vessel. But it can scarcely be doubted that in the above case, as well as in cases which I am about to relate, the septic infection took place through the raw and denuded surface of the umbilical fossa, the lymphatics being the carriers of the poison. We know how frequently granulations sprout out from the umbilicus of the newborn, and wherever there is a surface denuded of cuticle from which these may arise there is a surface from which microbes or toxic agents may be absorbed. The umbilicus, too, is a receptacle in which microbes, conveyed in the floating dust of an apartment, in foul water used for bathing, in dirty sponges, or abdominal binders or umbilical dressings, would be likely to lodge. M. Bonchut, in his remarks on the fall of the umbilical cord, says, “Cords volumineux, soft and plump, dry slowly and often suppurate at their base before they fall (*les cordons volumineux, mous et gras, se dessèchent lentement et suppurent souvent*

à leur base avant de tomber).”¹ With conditions so favorable for septic infection it is perhaps surprising that it does not more frequently occur, especially in hospital or asylum wards.

The patient whose case I have related evidently had systemic infection in addition to the local septic infection in the phlegmon. The numerous points of extravasated blood in the lungs and elsewhere showed this. But doubt must arise whether this general infection occurred from the phlegmon, in which there was intense hyperæmia and an active circulation, as shown by the inflammatory redness of the cuticle, or whether it resulted from and was connected with the diphtheria. But we will relate cases of systemic infection in which there was no diphtheria and in which the septic agent or agents entered the system through the umbilicus.

The volume of the *Transactions of the London Pathological Society for 1879* contains an able and elaborate report of the committee appointed by that society to investigate pyæmia, septicæmia, and purulent infection. Their report is based on the examination of the records of 156 cases occurring in the London hospitals, and it throws light on the cause of hemorrhagic extravasations occurring in cases of septic infection of the system. They remark: “On microscopical examination of different organs, micrococci were found in all, or at least in some, of the viscera. They were nearly all in the blood-vessels, completely plugging capillaries; in masses which sometimes produced varicosities, or even rupture of the vessels, and extended into the contiguous tissues.”²

CASE II.—Hilda M——, born February 28, 1888, was plump and robust, weighing eight pounds and seven ounces. The mother appeared to be well until March 3d, when she had fever and symptoms which were apparently due to pelvic cellulitis, probably of septic origin. The infant was fretful on March 3d and 4th, and on March 5th a small ulcer was observed in the umbilical fossa. The skin surrounding the umbilicus, over an area the size of a silver dollar, had a deep-red color, and the tissues underneath, constituting the abdominal walls, were infiltrated and thickened. The phlegmon gradually extended in every direction from the umbilicus, so that on March 6th it nearly reached the ensiform cartilage above and the pelvis below. The fauces had been inspected daily, and at 5 P. M., March 6th, the grayish-white exudate of diphtheria was observed for the first time, covering the tonsillar portion of the fauces on each side. On March 7th the exudate had increased, the cry was hoarse, the fingers livid at times, and fluid regurgitated through the nostrils. The phlegmon occupied nearly the entire abdominal walls anteriorly. March 8th, surface cyanotic; respiration labored,

¹ *Traité pratique des Maladies des Nouveaux-nés*, etc.

² *Brit. Med. Journ.*, January 24, 1880.

and at times accompanied by the expiratory moan; a diphtheritic pseudo-membrane in the right nostril. Death occurred at 6.30 A. M., March 9th, at the age of ten days, on the fourth or fifth day of the phlegmon and on the third day of the diphtheritic exudate upon the fauces. The rectal temperature varied from 99.8° to 102.8° , until the last day, when it was subnormal, being 96.6° ; the pulse varied from 90 to 112, and the respiration from 40 to 60. Both the pulse and respiration gradually increased in frequency until death, this increase being probably largely due to the double pneumonia. The tincture of the chloride of iron in glycerin, brandy, and breast-milk were given internally, iodoform and eucalyptized oil applied to the umbilicus, and antiseptic sprays employed to the fauces and nostrils.

Prof. T. M. Prudden kindly consented to conduct the autopsy, which was made with sterilized instruments and under conditions designed to prevent access to the body of adventitious germs. The following are his notes:

Autopsy.—The umbilical orifice was covered by a dry, brownish scab, beneath which was a small, rough-edged cavity containing a yellowish semi-solid mass. The abdominal wall, for about three centimeters around the umbilicus on all sides, was hard, thickened, and dusky red. A section through the abdominal wall in the line of the umbilicus showed that the wall was thickened to about 1.5 centimeters immediately around the latter.

Both the umbilical vein and the hypogastric arteries, to the distance of about 1.3 centimeters from their attachment to the abdominal wall, were much thickened, red and hard, and their inner layers were converted into a soft, yellowish, friable material. Beyond this point all of these vessels were filled with blood-clots and appeared healthy. There was no peritonitis, and all of the abdominal organs were normal.

The heart was normal. The pharynx, larynx, and trachea showed soft, reddish, friable patches of diphtheritic membrane partially covering their free surfaces. This membrane did not extend into the bronchi. The lungs exhibited broncho-pneumonia in both lower lobes, with considerable consolidation.

The microscopical examination of the parts about the umbilicus showed that at the point of attachment of the cord was a small pus-cavity whose walls were infiltrated with small spheroidal cells, with a few rod-like bacteria and with large numbers of spheroidal bacteria. Similar spheroidal bacteria were found in the purulent detritus contained in the cavity as well as within the lumina, and infiltrating the walls of the adjacent ends of the umbilical vein and the hypogastric arteries.

The tissues of the abdominal walls about the umbilicus were infiltrated with serum, fibrin, and a moderate amount of pus. Spheroidal

bacteria were rather scantily scattered in the lymph-spaces of the swollen tissues, being most abundant near the umbilical vessels.

Biological examination of the contents of the inflamed portion of the umbilical vessel showed the presence of several species of bacteria. The species which was by far the most abundant was readily identified as the *Staphylococcus pyogenes aureus*.

The anatomical diagnosis, then, is diphtheria of the pharynx, larynx, and trachea, with double broncho-pneumonia, localized septic inflammation of the umbilical vein and hypogastric arteries and of the abdominal wall surrounding them.

As the evidence of local infection is so great, it seemed desirable to gain some data as to the purity of the air in the wards. Accordingly, such analyses as time permitted were made by Dr. T. M. Cheeseman, Jr., who presented the following: "A biological examination of the air in the lying-in ward of the New York Infant Asylum, made on March 7, 1888, showed a very large number of living bacteria of many different kinds. Among them the *Staphylococcus pyogenes aureus* was of frequent occurrence. A second examination, made immediately after the usual sulphur disinfection, showed a large number of living germs."

CASE III.—Janse J——, born January 3, 1888, was wet-nursed by its mother, and apparently did well until January 16th, when the attention of the resident physician was directed to it, and an umbilical phlegmon was discovered as large as a twenty-five cent piece, the skin covering it being intensely red; temperature 98.5°. The dressing, after the discovery of the phlegmon, consisted in dusting with iodoform and the application of carbolic oil (one part of carbolic acid to twenty-five of sweet oil). January 17th, phlegmon not extending and its surface less red. The redness, thickening, and infiltration gradually abated, and on January 21st the patient was removed from quarantine. In this case there was no record of an umbilical sore; the fauces remained normal, so that the diagnosis of diphtheria was excluded. The mother continued well.

CASE IV.—George C—— was born in the maternity ward January 14th. On January 25th the nurse observed a small vesicle upon the border of the umbilicus, and removed the cuticle covering it. Some hours afterward the attention of the resident physician, Dr. Davis, was called to it, who found thickening and infiltration of the umbilical wall, most marked on the side which had been occupied by the vesicle. The same treatment was employed as in Case III. The records of January 26th and 27th state that the redness and infiltration are abating, and on the 29th the umbilicus had returned to the normal state.

CASE V.—John S——, born October 14, 1887, the mother being a

healthy primipara. The child was well developed at birth, weighing nine pounds and four ounces. The cord fell on the sixth day, and a small ulcer with indurated edges was observed in the umbilical fossa at the point of attachment of the cord. The induration in and around the umbilicus increased slowly until the ninth day. On the ninth day the child was restless, and on examination the ulcer was found enlarged and surrounded by a zone of inflamed tissue half an inch in width. The inflammation, accompanied by the usual infiltration and swelling, gradually extended, so that on the 15th the diameter of the inflamed area was two inches. The ulcer had also increased. On the twentieth day after birth the ulcer had attained the diameter of two inches and the depth of three-eighths of an inch, but the induration had begun to abate. From this time improvement was progressive, and no notes were taken after the twenty-fourth day. The rectal temperature, ascertained each day from the ninth to the twenty-fourth day, varied from the normal to 102° . During the active period of the phlegmon it was usually from 100° to 101.5° , and the emaciation was progressive, the loss of weight being estimated at two pounds. The treatment consisted in dusting with iodoform and the use of a compress of absorbent cotton soaked with a solution of carbolic acid. During the second week, under the advice of the attending physician, Dr. George B. Fowler, calomel was also dusted on the sore. On the twenty-fourth day the infant was removed to the Post-Graduate School, and its subsequent history is unknown. The mother had no unfavorable symptom.

CASE VI.—Joseph D——, born October 22, 1887, well developed, weighing seven pounds thirteen ounces. The cord fell on the eighth day, leaving a small ulcer at its point of attachment with an indurated border. Two days later, the tenth day after birth, the ulcer had increased slightly, being one-quarter of an inch in diameter. The surrounding tissues to the distance of one inch were thickened and indurated from inflammation. At no time was the temperature above 99.1° , and the child, though restless, nursed well. The tumefaction and hardness surrounding the umbilicus remained about the same until the sixteenth day, after which they gradually abated. The ulcer had healed at the end of the fourth week. The mother on the third day after confinement had elevation of temperature which continued four days; and six weeks after the birth of the child she had diphtheria in the usual form. During the same month—October—twenty-seven obstetrical cases were under observation, but all except this patient convalesced without an unfavorable symptom.

SECOND GROUP.—*Cases in which the septic poison probably entered the system through the umbilical vein.*

CASE I.—In May, 1884, an infant died of sepsis at the New York Infant Asylum at the age of fifteen days. It was apparently well until

about the close of the first week, when the umbilicus was observed to be raw, and a slight oozing of a puriform liquid occurred from it. During the second week the abdomen was hard and tender, and peritonitis was diagnosticated. The cord fell on the seventh day. During the second week the abdomen was apparently painful; the temperature three days before death was 100.6° , and two days before death 102.4° . Examination of the chest gave a negative result. The post-mortem examination was made by Dr. W. H. Welch, now professor of pathology in Johns Hopkins University. The abdomen contained six ounces of turbid serum with flakes of fibrin. The portion of the peritoneum covering the umbilical vein and along the under surface of the liver, especially at the transverse fissure, was covered with fibrin, but the peritoneum generally did not exhibit any notable hyperæmic or inflammatory appearance. Lymphatic vessels filled with purulent-appearing substance could be seen in the under surface of the diaphragm, showing in what way septic infection extends along the lymphatics. The lymphatics of the diaphragm open upon the pleural surface, and it is probable had the patient lived longer that septic pleuritis, perhaps on both sides, would have occurred. The umbilical vein was filled from the umbilicus to the transverse fissure of the liver with a grayish softened detritus consisting of broken-down thrombi with a considerable proportion of pus. Softened thrombi could be traced the entire length of the umbilical vein, the walls of which were thickened and infiltrated from inflammation. No thrombi were seen in the portal vein or vena cava; the pericardium contained more than the normal amount of serum with flakes of fibrin; hemorrhagic points were observed in the posterior portions of the lungs under the endocardial surface, under the peritoneal coverings of the kidneys and mucous covering of their calices. The mother did well, giving no evidence of disease of any kind.

CASE II.—This infant, born in the New York Infant Asylum, the date not being given, was well developed at birth, weighing eight pounds six ounces. When four or five days old it became feverish, the temperature rising to 104.6° . The cord separated at the usual time, and the umbilicus seemed healthy. At the age of two weeks an abscess appeared upon the scalp, another upon the back, and another upon the nates, which raised the suspicion of septic poisoning. At the age of four weeks orchitis on one side occurred, which continued three weeks, when it abated. When the child was two months old a prominence appeared about half an inch above the umbilicus, which Dr. Parker, the resident physician, punctured, and bile flowed from the incision. Subsequently the incision closed, and bile flowed from the umbilicus, and continued to flow until death, which occurred, in a state of much emaciation and weakness, at the age of eight months.

At the autopsy, made by Prof. Weleli, remains of old abscesses were found upon the trunk and extremities, and an abscess holding four drachms of pus was found over the occipital bone. Underneath the abscess the bone was carious and the dura mater thickened. The umbilical vein was much larger than normal, its walls being infiltrated and thickened, and its lumen of about twice its usual diameter. It contained thickened bile. One of the branches of the vein, traced into the liver, opened into an abscess the size of a walnut, which contained thickened pus with bile. The abscess was in the right lobe near its posterior border. The mother remained well.

CASE III.—Lizzie C——, born September 21, 1887, robust, weighing eight pounds, seemed well, taking the breast and having normal evacuations, until September 28th, when she became restless and refused the breast. Her temperature, rectal, was 101.4° , and her respiration was accelerated and accompanied by the expiratory moan. September 20th, temperature 103.6° ; respiration accelerated and painful and abdomen distended; no cough. The diagnosis of peritonitis, probably of septic origin, was made, but the umbilicus was of usual appearance, and the desiccation and fall of the cord seemed normal. The elevation of temperature, even to 104.4° , the distension of abdomen, and the hurried respiration with expiratory moan continued until death, which occurred September 30th.

At the autopsy three ounces of sero-purulent liquid containing flakes of fibrin escaped from the peritoneal cavity. All the abdominal organs were covered by a fibrinous exudation, the intestines being matted together by it. The umbilical vein was pervious; it contained clots of blood and dirty-looking pus, but the umbilicus was apparently normal. A segment of the aortic valve was thickened and rigid, and attached to it was a fibrinous mass. The appearance indicated an endocarditis of slight extent. Under the microscope the walls of the umbilical vein presented their normal appearance, but its dirty-looking and disintegrating contents probably contained septic matter. The hepatic cells exhibited the peculiar cloudiness observed in protracted febrile diseases. Otherwise the organs seemed healthy. In this case also the mother remained well.

CASE IV.—A. B.—, born January 22, 1868; father healthy, but mother strumous, though in good health during her gestation. The infant, born after an easy labor, was apparently well at birth, and it had sufficient breast-milk. When it was thirteen days old I was requested to visit it, as it had not been doing well, and I found it suffering from subcutaneous abscesses. Abscesses had occurred upon both legs, in the chest-walls of the right mammary region, in and around the metatarso-phalangeal articulations of one foot, and over both knee-joints. The child had fever, but its respiration was good until February 8th,

when it suddenly had a severe attack of dyspnœa, which continued until death, ten hours subsequently. On the following day Dr. Charles A. Leale and myself made the autopsy. The body was moderately emaciated. About one ounce of pus escaped from the right knee-joint. Pus was also found in the joint of the great toe on one side, and about two ounces in an abscess under the right pectoral muscle. A thin layer of tissue constituted the internal wall of the abscess, so that had life been prolonged a few days it would probably have broken through into the pleural cavity. The right lung was completely collapsed, and the pleura lining this lung, as well as that lining the thoracic walls on the same side, was covered by a fibrinous exudation. The left lung contained the normal, or perhaps more than normal, amount of air, so that it filled the pleural cavity, but there was a small amount of fibrinous exudate upon the parietal pleura in this cavity.

The trachea and lungs attached were removed, and on practising insufflation of these organs, air escaped from three openings in the posterior part of the right lung. These openings through which air had passed into the pleural cavity, causing collapse of the entire lung, were found on examination to have been produced by small abscesses in the tissue of the lung near its posterior surface. By the rupture of these abscesses the pus which they contained escaped into the pleural cavity, producing intense general pleuritis and pneumothorax. Numerous minute abscesses were found in both lungs, but only the three alluded to had been ruptured. It seemed certain that had the patient lived longer other abscesses would have ruptured.

CASE V.—In the following case bacteria were found making their way along the umbilical vein at a distance from the umbilicus, and also in the tissues involved in the umbilical phlegmon. Those in the phlegmon were apparently derived from the umbilicus and conveyed by the lymphatics. This case, therefore, might be placed in the first group as well as the second :

Anne — was born in the New York Foundling Asylum on May 18, 1888. A few days after birth, and before the cord dropped, the umbilicus was observed to be foul from secretion or exudation in it, indicating a sore at the base of the fossa. On the seventh day an umbilical phlegmon was noticed small and confined to the umbilical walls. Three white patches were also observed on the roof of the palate near the velum, not raised and apparently not diphtheritic, resembling superficial ulcers. All the infants born in the maternity ward of the Foundling Asylum receive Credé's treatment, designed to prevent purulent conjunctivitis, one drop of a 2 per cent. solution of nitrate of silver being instilled between the eyelids of each eye. Although this child was thus treated, she had a pretty active purulent conjunctivitis of the left eye, to which our attention was now called for the first time on

the seventh day. Credé's treatment was immediately reapplied to this eye, one drop being introduced between the lids. This was followed by the corrosive-sublimate treatment recommended by the late Prof. Samuel D. Gross. A solution of the sublimate, two grains to the pint, was dropped between the lids every hour to two or three hours, four or five drops being used each time. The conjunctivitis rapidly abated, and in less than a week had nearly or quite disappeared. But the phlegmon presented a very angry appearance, and the umbilical walls were greatly swollen, red, and denuded of cuticle. The inflamed area had a diameter of about four inches, with the umbilicus at the centre. Iodoform and carbolized oil were applied to the umbilicus and iron and stimulants given internally. The rectal temperature, taken May 26th, was 98°. Death occurred May 27th.

Autopsy, by Dr. W. P. Northrup, curator, thirteen hours after death.—Body well nourished; no rigor mortis; no external lesion except the umbilical; the phlegmon definitely outlined and hard, its central half brown and dry; the infiltrated abdominal wall had twice its normal thickness; peritoneal surface of phlegmon congested and adherent to omentum; from this point to the transverse colon was a leash of dilated vessels, one inch in width and three or four inches in length; peritoneum injected and a few petechiæ observed in the parietal layer and the mesentery; mesentery deeply injected; liver and spleen normal; kidneys soft and flabby; points of hemorrhagic pneumonia in all the pulmonary lobes; abundant tenacious mucus covering the surface of the stomach and intense injection, showing acute gastritis; cerebral pia mater finely injected, but without exudation; brain normal. Diagnosis: umbilical phlegmon, peritonitis, acute gastritis, hemorrhagic pneumonia.

Microscopical and Biological Examination, by Prof. Prudden at the Laboratory of the College of Physicians and Surgeons.—The small ragged cavity at the umbilicus contained a moderate amount of pus, cell-detritus, and enormous numbers of bacteria of various forms, the spheroidal form predominating. The tissues of the abdominal wall about the umbilicus were infiltrated with fluid, fibrin, and pus; scattered about in this exudation-mass were small spheroidal bacteria. The hypogastric arteries and the umbilical vein were plugged with clots extending from one-half to three-quarters of an inch from their origin; their walls were greatly thickened by infiltration with inflammatory exudate. Both in the lumina of these vessels, along the sides of the clots, and in the lymph-spaces in their walls were enormous numbers of small spheroidal bacteria. These bacteria were present in the umbilical vein beyond the limits of the clots in the direction of the liver.

The kidneys showed moderate parenchymatous degeneration. The consolidated areas in the lungs were due to a nearly complete filling of the air-spaces and the smaller bronchi with blood.

Cultures made from the inflamed tissue about the umbilicus and from the edges of the sloughing cavity showed several species of bacteria common in the air and in the feces of children. In addition to these the *Staphylococcus pyogenes aureus* was present in large numbers. A set of cultures from the inside of the umbilical vein, at a little distance from the sloughing cavity, revealed the presence of *Staphylococcus pyogenes aureus* and *Streptococcus pyogenes*, together with other forms. Cultures from the liver showed large numbers of *Staphylococcus pyogenes aureus*, with considerable numbers of a stout bacillus similar to one abundant in the sloughing cavity. From the lung tissue from the consolidated regions enormous numbers of bacilli developed in a nearly pure culture, which corresponded in its biological characters to the *Bacterium lactis aërogenes* of Escherich.

Remarks.—This child would thus seem to have been the victim of infection with the ordinary “suppurative bacteria” and with feces. We infer that fecal matter in some way came in contact with the umbilicus.

THIRD GROUP.—*It seems probable that in exceptional instances the septic poison in sepsis of the newly-born is received in other ways or other channels than at the umbilicus.*

If sepsis of the newly-born occur through absorption from an umbilical sore, may it not also from a sore located elsewhere? Decomposing and disintegrating animal tissue, wherever located, may be the source of septic infection. Moreover, medical literature contains histories of epidemics of puerperal fever in which newly-born infants perished with what was often designated erysipelas, but which the modern pathologist would unquestionably designate sepsis. The disease which I have described as umbilical phlegmon, a local sepsis, was commonly regarded by the older writers as a form of erysipelas. Dr. Condie, in his *Treatise on Diseases of Children*, described in the following lines what we would now designate sepsis:

“Erysipelas of infants very commonly occurs during the prevalence of epidemic puerperal fever. Children of mothers who become affected with the fever are often born with erysipelatos inflammation; others are attacked almost immediately after birth. Whether in these cases the disease is to be referred to a morbid matter applied to the skin in the womb, or to the same endemic or epidemic influence which gives rise to the disease of the parent, it is difficult to say. According to M. Trousseau, infantile erysipelas is principally observed when puerperal fever prevails in the wards of the lying-in hospitals of Paris.”

The late Dr. Folsom of this city furnished me the following sketch of cases which occurred in his practice and that of his partner: “About the year 1840, being then in practice in New Bedford, Mass., I was called to visit a man who complained of pain in the knee. The next

morning he was easier, but the following evening his symptoms grew worse, and, as I was engaged in a case of obstetrics, my partner, Dr. E. C., now dead, visited him. At my call, next morning, I unexpectedly found the patient dying. The disease was obscure, and at the autopsy next day no lesion was discovered. In making the examination Dr. C. pricked his finger, and, experiencing little inconvenience from it at first, he attended a case of confinement on the following morning. A few hours subsequently he was taken sick, and I took charge of the lady, who died in three days, having the tumid abdomen and symptoms of childbed fever. The infant of the patient was seized, when two days old, with erysipelas, appearing on the face and in spots on the trunk and limbs, and terminating fatally in one day. Dr. C.'s finger became swollen and painful, and the lymphatics of the forearm and arm became inflamed, presenting red lines, and the axillary glands suppurated. Though feverish and much prostrated, there was no appearance of erysipelas in his case. In about two weeks he resumed practice, and, as at that time, physicians in this country were not fully aware of the danger of communicating puerperal fever, he attended two, three, or four obstetrical cases each week until the number reached fifteen. All the mothers died with symptoms of metro-peritonitis, and all the infants had erysipelas, commencing on the face or some part of the body, generally on the second or third day after birth, and in all terminating fatally within a week. This sad record was finally ended by the doctor's temporarily retiring from practice."

What better description could be given of a malignant form of septic infection? It will be observed that the unfortunate doctor did not have erysipelas, but inflammation of the lymphatics, occurring from the poisoned finger, and the infant who first contracted the disease and died of one day's sickness exhibited red spots upon the trunk and limbs of an erysipelatosus appearance. Did the doctor poison the mothers and infants at the same time by his digital examinations? did he poison the mothers by his infected fingers, and they in turn poison the babies through the placental circulation? or did the infected mothers communicate the poison through the breath or milk? This is an interesting subject for inquiry in regard to which we are in the dark. Fortunately, the profession are now fully aware of the danger of septic infection, so that no intelligent and prudent accoucheur would attend an obstetrical case after making a post-mortem examination or visiting a case of puerperal fever without change of clothing and thorough personal disinfection, and consequently cases belonging to our third group are much more rare than formerly.

It is evident that sepsis of the newly-born might be prevented in a large proportion of instances by proper antiseptic dressing of the navel. Boric acid is a feeble and inefficient antiseptic, and the bor-

ated cotton which was employed in dressing the navel when the cases in the maternity ward occurred which have been related above was inadequate to prevent infection. Of the powders which might be prescribed for this purpose, salicylic acid or deodorized iodoform mixed with starch would appear to be much more efficient. Credé's method of preventing purulent conjunctivitis by instilling one drop of a 2 per cent. solution of nitrate of silver between the lids has been very effectual. Probably in a similar manner umbilical phlegmon might be prevented in maternity wards by bathing daily the umbilicus with a solution of the sublimate, grs. ij to the pint.

When an umbilical phlegmon has commenced we have employed dusting with iodoform, the application to the navel every two hours of carbolized sweet oil (1 to 30), and bathing the navel with a solution of corrosive sublimate, two grains to the pint of distilled or boiled water. In some of the cases thus treated when the phlegmons were small the patients gradually recovered, but in most of the cases the phlegmons were so large, and the microbes at such a distance from the umbilicus in the tissue of the abdominal wall, that antiseptics applied upon and around the umbilicus were not curative. Newly-born infants are probably too young and feeble to be satisfactorily treated by incisions in the phlegmon and the application of antiseptics to the incised surfaces, else this treatment might be more efficient than treatment without such incisions.

DIPHTHERIA OF THE NEWLY-BORN.¹

Diphtheria of the newly-born is rare and the literature of it meagre. Nevertheless, a considerable number of cases under the age of one month has been reported. Oertel is mistaken when he writes: "... In the first half year the infant organism seems to be not at all susceptible to the disease." Dr. Abram Jacobi writes in his *Treatise on Diphtheria*: "I have met 3 cases of diphtheria of the larynx and pharynx in the newly-born myself. One of these became sick on the ninth day after birth, and died on the thirteenth day; the other died on the sixteenth day after birth; the third was taken when seven days old, and died on the ninth day." Dr. Jacobi alludes to the thesis of Sirédey of Paris, published in 1877, in which 18 cases of diphtheria of the newly-born are related. They occurred during the spring of 1877 in the Hospital Lariboisière. He alludes also to several cases reported by Parrot, 1 of fifteen days by Bretonneau, 1 of seventeen days by Bednar, 1 of eight days by Bouehut, and 1 of seven days by Weikert.

Diphtheria, which had been prevailing in the New York Infant Asylum since October, 1877, appeared in the maternity wards of the

¹ *Medical News*, Sept. 8, 1888.

institution in January, 1888. The patients affected with it were all newly-born infants, the mothers, although mostly young, escaping.

CASE I.—Violet M——, whose case is related in the article on Sepsis. When she was six days old the phlegmon commenced; two days afterward nasal catarrh began, and a day later, when she was nine days old, the diphtheritic exudate was observed in her left nostril and upon the faucial surface. The symptoms in full are recorded in the article on Sepsis. Death occurred at the age of ten days. At the autopsy the pseudo-membrane was found on the surface of the fauces, both surfaces of the epiglottis, and the entire larynx to a point a little below the vocal cords. The vocal cords were completely concealed from view by the pseudo-membrane.

CASE II.—Olivia G——, born January 8th, was wet-nursed by her mother, and was apparently well until January 14th, when she became restless. On the following day, when she was seven days old, she was carefully examined and diphtheritic patches were observed upon the faucial surface. Rectal temperature 100° , respiration 36, pulse 120. She had commencing nasal catarrh, which so obstructed the breathing that she could not take the breast, and she was fed with the mother's milk from a spoon. Directions were given to syringe the nostrils at intervals of two hours with the following:

R̄. Ol. eucalypti,	ʒj ;
Sodii bicarbonat.,	
Sodii benzoat.,	āā. ʒij ;
Glycerinæ,	ʒj ;
Aq. calcis,	ʒvj. M.

Small doses of the tincture of the chloride of iron and brandy were also given at short intervals.

16th. Deglutition is so difficult that almost no nutriment is taken; breathing obstructed; features and extremities livid; temperature $101\frac{1}{5}^{\circ}$ to $103\frac{1}{5}^{\circ}$; pulse, 120, 112, 104; respiration, 32, 34, 46; discharge from nares tinged with blood. The mustard-bath was employed, but without producing reaction.

17th. The diphtheritic patches remain on the faucial surface, and the right nostril is plugged by an exudate of the same appearance. Rectal temperature at different hours through the day was $98\frac{1}{2}^{\circ}$, 98° , 99° , 98° ; pulse, 120, 118; respiration, 32, 38; pulse weak and surface cyanotic and cool. About one teaspoonful of brandy was given through the day, and the same quantity of milk; hot bottles applied.

18th. Nostrils discharging freely; temperature, 103° ; pulse, 140; respiration, 45, 60. Cry hoarse, pulse very feeble. Died at 11 P. M.

Autopsy, January 19th.—In addition to the diphtheritic exudation

already mentioned, occurring upon the faucial and nasal surfaces, a pseudo-membrane was found covering the larynx, trachea, and œsophagus to within one inch of the stomach. The lungs contained numerous points of extravasated blood. No notable change was observed in the appearance of the kidneys, heart, and other organs.

CASE III.—Victor K——, born December 7, 1887. On January 13th, when Victor was thirty-seven days old, his mother called the attention of the resident physician to him, as he seemed seriously sick. His temperature was 103.2° , and his breathing indicated nasal catarrh. On the following day, the 14th, the characteristic grayish-white diphtheritic pellicle was observed on the left side of the uvula. The inability to remove it by brush or washing demonstrated its diphtheritic nature. The temperature on the 14th varied from 99° to 102.4° , the pulse from 88 to 96, and the respiration from 26 to 38, having the Cheyne-Stokes' character. The pulse was weak and the extremities and face cyanotic. On the 15th his temperature was 102° ; respiration, 20, with long intervals; and the frequency of the pulse could not be ascertained from the weak action of the heart. Death occurred at 5 P. M. Diagnosis: bronchitis, nasal and slight pharyngeal diphtheria. The right cavities of the heart were greatly distended with blood. No pseudo-membrane was found in the larynx, trachea, and bronchial tubes, but only the hyperæmia of bronchitis. Lungs normal, except hypostatic congestion of posterior portion of each.

CASE IV.—Vincent B——, born December 31, 1887, was apparently well until January 17th, when symptoms of a catarrhal nature attracted attention. The nostrils seemed to be unaffected, but upon the posterior surface of the pharynx was a distinct diphtheritic patch; temperature, 98.5° ; respiration, 32 to 40; pulse, 114 to 120.

18th. Discharge from nostrils; temperature, 98.5° ; pulse, 116 to 118; respiration, 36. The same nasal and throat wash was used as in the other case. On the 19th the exudate on the surface of the fauces had nearly or quite disappeared.

20th. Nasal catarrh less and infant apparently improving. Pulse, 118; respiration, 28; temperature, 98.5° .

21st. No discharge from nostrils, and fauces apparently free from pseudo-membrane. The infant soon fully recovered.

CASE V.—Hilda M——. This case is fully detailed in the section on "Sepsis." She was fretful when four days old, and at the age of six days an umbilical phlegmon was discovered. The fauces were inspected daily, and when at the age of seven days the grayish-white exudate of diphtheria was observed for the first time covering both tonsils. On the following day the exudate appeared in the right nostril. Death occurred on the tenth day, and at the autopsy, in addition to the phlegmon, the pharynx, larynx, and trachea showed soft, reddish,

friable patches of diphtheritic pseudo-membrane partially covering their surfaces. The membrane did not extend into the bronchi.

Diphtheria of the newly-born is sometimes wrongly diagnosticated. Thus in the New York Foundling Asylum, where diphtheria was occurring, the tonsils of an infant a few days after birth presented a grayish-white appearance, and diphtheria was diagnosticated. After its death the curator, Dr. Northrup, discovered a pulraceous state of the surface of the tonsils, but no pseudo-membrane. The disease was not diphtheria. But in regard to the cases related above there can be no doubt of the correctness of the diagnosis, unless in regard to Case III. The occurrence of five cases in so short a time in a rather small maternity service shows that under certain circumstances the newly-born infant exhibits considerable susceptibility to diphtheria.

A very interesting and important subject for consideration arises in connection with these cases—to wit, personal and domiciliary disinfection. The occurrence of so many cases of umbilical phlegmon and diphtheria showed that the maternity ward was infected to such a degree that subsequent patients could not be safely admitted without thorough disinfection. The ward was vacated, the windows, doors, and crevices closed, and forty pounds of sulphur, or two pounds to the one hundred cubic feet of air, were burnt during the day until it was consumed. After some hours the windows and doors were opened, and Drs. Prudden and Cheeseman immediately raised a dust from the floor and bedding and allowed it to settle in culture media. All other sources of infection were excluded from the media. The culture produced so large a number of microbes that they overlaid each other, but they were able to distinguish the *Streptococcus pyogenes*, which had been previously discovered in the umbilical phlegmon. Although more sulphur was employed than is recommended by the Health Board, the result appears to have been negative as regards destruction of the microbes. Some more efficient mode of domiciliary disinfection should be devised. I recommend to wash the floors, walls, and furniture of an infected room with a strong solution of corrosive sublimate. This might be done frequently during the progress of a case of diphtheria. In order to disinfect the air of an apartment where a diphtheritic patient is under treatment a disinfectant mixture should be placed over the gas, oil, or other stove in shallow pans with broad surfaces, and kept in a state of constant ebullition or simmering. I prefer for this purpose the following prescription :

R. Acidi carbolici,
 Ol. eucalypti, āā. ʒj ;
 Spts. terebinth., ʒvj–viij. M.

Add two tablespoonfuls to one quart of water for ebullition.

One important advantage arises, I think, from this mode of disinfecting the air—namely, that the physicians and attendants are less likely to convey the disease in their clothing. It is probable that the danger of communicating diphtheria to other children or to obstetrical cases is greatly diminished if the air be sufficiently loaded with the disinfecting vapor. No more cases have occurred in the Infant Asylum since this mode of disinfection was employed.¹

Although the prognosis in diphtheria of the newly-born is very bad,

¹ As the ordinary mode of domiciliary disinfection seemed to be entirely futile in the maternity wards where the above cases occurred, it seemed to me advisable to obtain the views of so eminent an authority as Dr. E. R. Squibb of Brooklyn, and he has kindly favored me with the following note:

“Within the past ten years the efficacy of sulphur fumigation against infectious material has been repeatedly denied and reaffirmed upon very good authority, and observations, apparently made with accuracy and care, have been reported from time to time to prove both sides of the question; so that all that can now be said is that burning sulphur is of doubtful efficacy, with the weight of the highest authorities in bacteriology against it. But to this it must be added that it is still largely used by very intelligent bodies in large institutions, boards of health, etc., where it would not be likely long to maintain an unearned confidence.

“How often the fumes are applied dry, and how often moist, no one can tell from the current record, and how many of the failures of the dry gas would be successes in the presence of moisture there is no means of knowing.

“Formerly, when sulphur was burned in closed chambers as a disinfectant, the surfaces were all wetted, and the pot of burning sulphur was set in water or in wet sand, that the heat might evaporate off a constant supply of watery vapor.

“These conditions are now frequently, if not generally, neglected, and where this is the case failure on principle should be the rule.

“Nearly all, if not all, chemical disinfectants are in a state of tension, ready to change on coming in contact with the matter to which they are applicable; and these changes are either by oxidation or deoxidation, and the moment of greatest power or activity is the moment of change, where they, by reacting with infectious matter, pass from a state of tension to a state of rest under new relations. The agency through which these changes almost universally become operative is the vapor of water.

“When sulphur is burned in a close chamber, the dioxide is formed by condensing two molecules of oxygen from the air upon each molecule of the sulphur, and a heavy gas is the result, which tends to settle at the bottom of the chamber and to run out through the lower cracks. Any moisture present is at once seized by this rather inactive anhydride, first forming sulphurous acid, and then, by oxidation from the air, sulphuric acid. The dry gas, or anhydride, not only seizes with avidity all watery vapor in the air, but also the water held in the surfaces of all bodies with which it comes in contact, and in the presence of this moisture only is it ready for further oxidation. Then it is by this oxidation that it deoxidizes the matters with which it is in moist contact, filling the surfaces of these matters first with sulphurous acid, then, by the change, with sulphuric acid; and it is during these changes that its power is exerted.

“If there be no moisture supplied to the burning sulphur, that which was present in the air and the surfaces of the chamber is soon used up, and the dry gas remains indefinitely in a comparatively inactive, ineffective condition. The dry, passive anhydride would necessarily destroy all organisms which breathed in any degree, because breathing surfaces are moist. But in embryonic life, protected by shell, as in seed, if the shell be dry the gas would be impotent. Many bacteriologists have admitted that burning sulphur would kill bacteria, but not germs.”

it is not necessarily fatal, as is seen by the above cases. Does it require, on account of the age, any modification of the usual mode of treatment? Very few, probably, would recommend the internal use of corrosive sublimate for patients so young, but there seems no objection to the local use by the swab or camel's-hair pencil of so weak a solution as that employed by Dr. Oatman and others—two grains to the pint of water. The old remedy of the tincture of the chloride of iron, so long employed as a blood-restorer, and properly prescribed as a chief remedy in diphtheria, which is attended by a rapid destruction of the red corpuscles and progressive anæmia, seems to be a proper remedy for any age. It was employed in the above cases in doses of one to two drops.

THRUSH.

The terms thrush, sprue, and muguet—the last from the French—are synonymous. They are used to designate a form of inflammation of the mucous surfaces the peculiar feature of which is the presence of points or patches of a curd-like appearance on the inflamed surface. The usual seat of thrush is the buccal membrane, but occasionally it occurs on the faucial and œsophageal surfaces. It is very rare in the subdiaphragmatic portion of the digestive tube, but a few such cases have been reported by Billard and others. It never occurs upon the membrane of the nostrils, larynx, or bronchial tubes, and it very seldom occurs upon any other surface without also being present upon the buccal mucous membrane. Thrush, then, is a stomatitis, pharyngitis, œsophagitis, or gastro-enteritis with the additional element which I have mentioned.

Causes.—The younger the infant the greater is the liability to thrush when the causes favorable for its occurrence are present. It is therefore common in infants under the age of six weeks, and a majority of the cases occur under the age of six months. The common causes of this disease are such as ordinarily develop a stomatitis, prominent among which are improper feeding, indigestion, gastro-enteritis, and the cachectic state, whether arising from prematurity, congenital weakness, or enfeebling diseases. The most common and obvious of the causes alluded to is the use of indigestible and improper food, which produces a gastro-intestinal catarrh, soon followed by stomatitis. Thrush is therefore a common disease among foundlings in institutions where these unfortunates are received, since they not only breathe an atmosphere which is often impure, but are deprived of the mother's milk, and are so frequently given a diet which is a poor substitute for it. Infants in crowded tenement-houses of the cities and in destitute families, whose diet is often very unsuitable, are much more liable to thrush than infants well fed and well cared for in well-to-do families.

In infants under the age of three months the cause of thrush is often mild, and soon removed by better hygienic conditions and improvement in the diet. An improper diet for a few days, or a slight gastro-intestinal catarrh which quickly subsides when the cause ceases, is sufficient to develop the disease. In the newly-born the frequent use of sweetened carminatives or of sweetened dietetic mixtures administered by the nurse often gives rise to sprue, which ceases when these drinks are withheld and a proper mouth-wash applied. But after the age of six months, and especially after the age of one year, the condition giving rise to sprue is much more serious. After the age of twelve months sprue is comparatively rare, and when it does occur it is usually in the later stages of a protracted and exhausting disease; and in such cases it is an unfavorable prognostic sign. Under such circumstances it occurs even in childhood, youth, and adult life, and is justly regarded as a complication of grave import. Thrush, being a parasitic disease, is believed to be communicable by contact, like the parasitic skin diseases, but not through the atmosphere. Thus in the wards of a foundling asylum the tip of a nursing-bottle used by different foundlings, if not properly cleaned after its use, may be the means of communicating it.

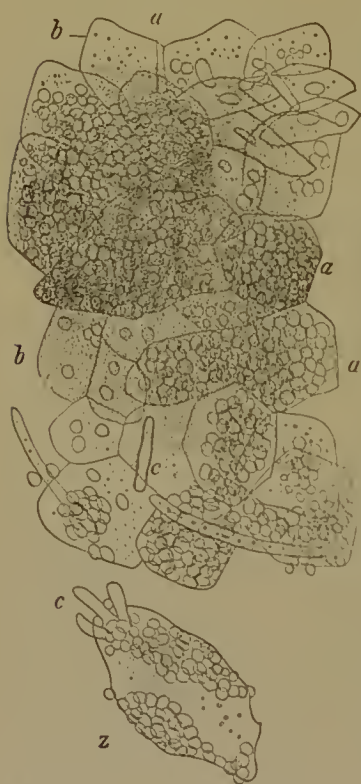
Anatomical Characters.—The first stage of thrush is that of simple inflammation of the mucous surface. The mixed salivary and mucous secretions in the mouth, which are normally alkaline, become acid. There next appear upon the mucous surface minute semi-transparent points or granules, which, increasing, soon become white and opaque. Some of them remain as points, while others, extending and perhaps coalescing with those adjoining, form patches of greater or less extent. The white points or patches are unequally elevated. Their central part, which was first formed, is most raised, while their circumference projects but little above the epithelium. Their highest elevation is ordinarily not more than a line above the surface. They resemble closely in color and consistence portions of curdled milk, and the nurse often mistakes them for such and neglects to call attention to the state of the mouth. They are readily detached by a little force, when the mucous membrane underneath is seen to be in its integrity. Their color in the first days of sprue is white, and sometimes this color continues. In other cases they assume, if the disease be protracted, a yellowish hue.

Their true nature, long unknown, was finally revealed by microscopy. They consist in part of epithelial cells and in part of a vegetable growth. This parasite is the *Oidium albicans*, discovered by Berg of Stockholm, but more fully described by Gruby and Charles Robin. The roots of the parasite are transparent, and they penetrate the epithelial layer sometimes even to the basement membrane. The branches arising from

these rootlets divide and subdivide at an acute angle, and under the microscope are seen to consist of elongated cells with one or two nuclei. The branches or the mycelium is formed by the union of the cells at their extremities. Numerous spherical or ovoid spores are also present surrounding the mycelium and covering the epithelial cells. Haller states that he has identified this parasite with the *Oidium lactis*, which occurs in milk undergoing acid fermentation. The spores are primarily developed, and are found in the scraping of the mucous surface in the vicinity of the patches of sprue. In two instances in examining the product of thrush removed from the œsophagus I found that the parasitic plant was the *Penicillium glaucum* or a conferva closely resembling it.

We have described the ordinary form of thrush as it occurs in young children, but if the patches are of large size and abundant, and the

FIG. 137.



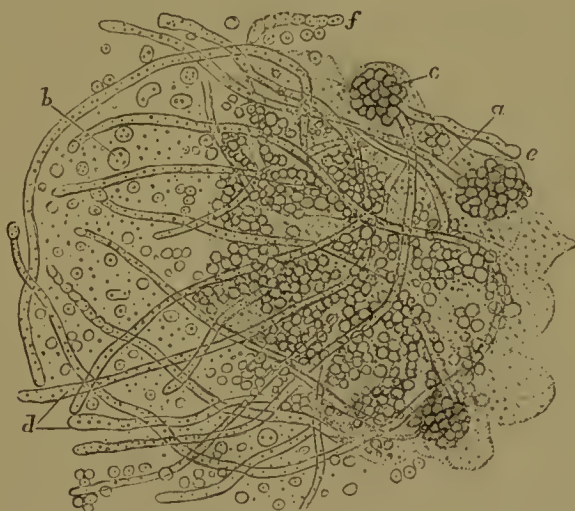
Pavement epithelium covered by spores of the *Oidium albicans* (Ch. Robin).

buccal surface generally of a deep-red color, there is usually some severe prostrating and dangerous disease on which the thrush has supervened. We have already alluded to the fact that thrush in its severe forms often results from and complicates some grave disease, as protracted gastro-intestinal catarrh or a chronic pulmonary malady. Hence some writers who have observed thrush in foundling asylums regard it as one of the most serious maladies of early life. Valleix, in a book of more than seven hundred pages relating to the diseases of children, devotes more than one-third of it to the consideration of muguet, but those pathological conditions pertaining to the digestive apparatus which most observers regard as distinct from sprue, though sustaining a causal relation to it, he includes in the description of muguet. Of 24 cases the records of which he publishes, 22 died, but their death was in most instances due to gastro-intestinal inflammation, which the author describes under the term "muguet." Most writers

properly restrict, as stated above, the term thrush, sprue, or muguet to those inflammations of mucous surfaces which are accompanied by the peculiar parasitic outgrowth, regarding the severe subdiaphragmatic inflammations from which Valleix's patients died as distinct from muguet,

though sustaining a causal relation to it. In the post-mortem examinations which I have witnessed in the Nursery and Child's Hospital, Infant Asylum, and Foundling Asylum of this city, of those having thrush at the time of death, who for the most part have been infants under the age of three months, I have frequently found evidences of inflammation in every division of the alimentary canal. The parasitic

FIG. 138.

Spores and Branches of the *Oidium albicans* (Ch. Robin).

growth was, however, never seen below the cesophagus. Parrot, however, states that he has discovered it in rare instances in the larynx, stomach, and intestines.

Symptoms.—Thrush in itself does not give rise to any symptoms except those that pertain to the surface which is the seat of the parasitic growth. Other symptoms are not referable to it, but to the diseases in the course of which it is developed and which it complicates. Sprue is preceded and accompanied by the symptoms of gastro-intestinal catarrh or some other disease which disturbs the digestive function, affects the secretion of the digestive apparatus, and causes acidity of the buccal surface. The mucous membrane, upon which the cryptogam is soon to appear, becomes red, hot, tender to the touch. As we have stated above, it gives the acid reaction more or less marked to litmus-paper, and in the scraping from its surface placed under the microscope the spherical or oval spores of the *Oidium lactis*—or, which is the same, the *Oidium albicans*—are observed. A few hours later small white points appear, at first scarcely visible, produced by the cryptogamic growth and the epithelial and amorphous matter adherent to it.

These points enlarge, and within a day or two present the well-known appearance of small masses or patches of curdled milk. They

are fragile and readily detached, but are soon replaced by others so long as the cause continues. In the worst forms of thrush the surface upon which the cryptogam appears not only presents the ordinary features of severe inflammation, such as heat, redness, and tenderness, but it is sometimes deficient in the natural secretion, so as to present a dry or parched appearance. In these severe cases there is usually in young infants obstinate and protracted inflammation of subdiaphragmatic portions of the digestive tube. The 24 cases related by Valleix, alluded to above, 22 of which were fatal, were of this kind. But the gravity of such cases, in which thirst, anorexia, restlessness, vomiting, diarrhœa, and progressive emaciation occur, is due, as stated above, to the primary disease which has produced the conditions favorable for the occurrence of sprue. If sprue occur, its symptoms should be differentiated from the more pronounced symptoms of the disease which it complicates.

Diagnosis.—This is not difficult, so far as relates to thrush of the buccal surface, for simple inspection reveals its presence. If a particle of one of the patches be placed under the microscope, the mycelium and spores of the *Oidium albicans* are readily detected. Only the inexperienced could mistake the diphtheritic exudate for the growth of sprue or *vice versâ*. The diphtheritic pellicle penetrates the mucous membrane, from which it is detached with difficulty, leaving underneath a raw and bleeding surface; and it is thick and tough, contrasting in these particulars with the product of sprue. Enlargement of the cervical glands is also common in diphtheria and is absent in sprue.

Particles of coagulated casein upon the tongue and gums bear a close resemblance to the patches of thrush, but their relation to the mucous membrane is simply that of contact, and they are removed by a spoonful of water.

Prognosis.—The duration of thrush varies according to the duration and nature of the primary disease which it complicates. In young infants who have indigestion or slight gastro-intestinal catarrh it is quickly cured by appropriate local treatment if the nutriment given be of the proper kind and the stomach and intestines be restored to their normal state. On the other hand, thrush occurring in the course of chronic and highly debilitating diseases is not so quickly cured, or if cured is likely to return. It does not materially increase the gravity of the malady in the course of which it occurs, but when it complicates a chronic disease it indicates a reduced state of the system, an impairment of the general nutrition, which if it continue is likely to end fatally. As M. Bouchut has pointed out, when Baron states that 109 out of 140 patients with muguet died of this disease, and Valleix, as I have stated above, says that he lost 22 out of 24 cases from the same cause, they attribute to a comparatively unimportant complication what was

really due to a grave internal disease. Thrush does not itself cause death, though it may be a sign of bad omen. Death when it occurs is from a visceral affection which precedes and accompanies the sprue, and is likely to continue after every vestige of the latter is removed by local measures, unless it receive appropriate internal treatment.

Sprue is a bad omen if the tongue and buccal surface be dry, hot, and highly injected, the coating of the tongue of brownish color, the infant fretful with the appearance of suffering in its physiognomy, and having progressive loss of flesh and strength. Such symptoms indicate in most instances a fatal form of gastro-intestinal catarrh. On the other hand, in young infants, since indigestion and slight gastro-intestinal derangements are adequate to cause an acid state of the buccal surface and the development and extension of the *Oidium albicans*, the large majority of the cases of thrush in which the general condition is good and the stomatitis mild are quickly cured by appropriate treatment.

Treatment.—Since the common cause of thrush in infancy is the use of indigestible or improper food, the physician should ascertain the nature and mode of preparation of the infant's diet, and, if it be faulty, should direct one that is better. If the infant be bottle-fed, the mother's milk or that of a wet-nurse should, if practicable, be substituted for the artificial feeding; but if this be impossible, a diet should be selected which bears the closest possible resemblance to the mother's milk in digestibility and nutritive properties.

There is often in thrush an excess of acidity in the digestive tube, and an alkali is required. Trousseau recommends the addition of saccharate of lime to the milk. Children with this disease should also be taken from filthy and damp apartments to those in which the air is pure and dry, and their mouths and persons should be kept clean.

The remedy in common use in the treatment of thrush, and which is usually effectual, is borax. This, if applied sufficiently often to the affected membrane, not only destroys the parasitic growth, but prevents its reproduction. It is commonly employed with honey or in a powder with sugar or dissolved in water. The officinal *mel boracis*, consisting of one part of borax to eight of honey, is so much used in families that it may be considered almost a domestic remedy. There is, however, an objection to using any application for the removal of thrush which contains either sugar or honey, since either substance remaining in the mouth would rather promote the growth of the parasite. Still, it is desirable to employ a wash of such consistence that it will remain a longer time in contact with the buccal surface than will a simple solution in water. I know no better vehicle for the borax than glycerin, which has the advantage of consistence, does not undergo any chemical change, and has no unpleasant flavor. The borax may be used dissolved in glycerin, with or without some flavoring ingredient:

R̄. Sodii borat.,	ʒj ;
Glycerinæ,	ʒij ;
Aquæ,	ʒvj. Mīsec.

Borax should be used four or five times daily, and continued for a time after the disease has disappeared from sight, since the roots of the plant must be destroyed or the branches are rapidly reproduced. It should be applied by a camel's-hair pencil or with a soft cloth upon the finger or a stick. It should be so freely used in extensive and severe forms of the disease that the infant will swallow some, since the entire œsophagus is often also the seat of sprue in such cases. In the intervals between the applications of borax, if the buccal surface be hot, dry, and tender, so as to increase the fretfulness of the infant, it is well to use mucilaginous washes, as the mucilage of acacia or mallows. If the disease continue notwithstanding the use of these measures, the mouth should be occasionally washed with a weak solution of nitrate of silver or sulphate of zinc :

R̄. Zinci sulph.,	gr. ij-iv ;
Aq. rosæ,	ʒij. Mīsec.

In many cases, however, the treatment of thrush is of less importance than that of the disease which the thrush complicates. The remedial measures which I have mentioned then become subordinate to those employed for the graver disease. When this disease is relieved and the general health improves, thrush is more easily and permanently cured than during the state of febleness and ill-health.

HÆMATEMESIS NEONATORUM AND MELÆNA NEONATORUM.

Hemorrhage from the gastro-intestinal surface occurs in children from various causes. It is a common symptom of intussusception in infants. It occurs from dysentery and purpura and from the syphilitic dyscrasia. It has been observed in polypus of the rectum and in anal fissures. In rare instances it occurs from the irritation of lumbrici, from foreign substances which have been swallowed, and from the ulceration of typhoid fever. Intestinal hemorrhage from such cases is a symptom of constitutional or local disease. But in newly-born infants it sometimes occurs without other symptoms or without other appreciable disease, and therefore is regarded as an essential malady.

Melæna neonatorum was mentioned by Storek in 1750, and various writers at different times alluded to it or briefly described it prior to 1825. In 1825 it was more fully treated of by Hesse than by any of his predecessors.¹ The monograph published by him was valuable, as

¹ *Annalen von Pöcher*, 1825, Heft 6.

it contained his own observations and those of contemporary physicians communicated to him, as well as the investigations of his predecessors. Dr. Rahn-Escher of Zurich (1835), Meisner (1838), Kiwisch (1841), Runpe (1841), Hoffman (1842), and Helmbrecht (1843) published memoirs or related cases of melæna. Several of the best-known authors on diseases of children, long recognized as authorities in this branch of practice, have also written on intestinal hemorrhage, as Billard, Vogel, Rilliet and Barthez, Barrier, Bouchut, West, Eustace Smith, and Goodhart, so that the literature of this disease is no longer meagre.

Age.—In the statistics of Billard, embracing 15 cases, 8 were between the ages of one and six days, 4 between the ages of six and eight days, and 3 between the ages of ten and eighteen days. Of 20 cases embraced in the memoir of Rilliet and Barthez, 9 were at or under the age of thirty-six hours when the hemorrhage began, 5 between the ages of two and four days, 2 between six and eleven days, and 2 at the ages of fifteen and twenty weeks. Of 50 cases collated by Croom¹ from various sources, gastro-intestinal hemorrhage took place in 30 between the first and sixth days, in 8 between the sixth and eighth days, in 4 between the eighth and twelfth days, and in 8 between the twelfth and eighteenth days. The bleeding began in 6 within the first twenty-four hours. These statistics, which correspond with those of other observers, show that in a large majority of cases the hemorrhage occurs within the first twenty-four hours. Hæmatemesis also takes place along with the intestinal hemorrhage in a considerable proportion of cases.

Etiology.—The cause of melæna of the newly-born is involved in some obscurity. To a considerable extent the causes are the same as in hemorrhage from the umbilicus, which we have treated of in a foregoing page. A predisposition to this and other forms of hemorrhage is sometimes inherited. Dr. Rahn-Escher states that the mothers sometimes have digestive ailments or other forms of ill-health, which he thinks produce atony of the vessels in the infants. The infant sometimes belongs to a family of bleeders and inherits hæmophilia. In the *Medical Times and Gazette* for October, 1880, Dr. Croom relates 4 cases in which there appeared to be an hereditary tendency to bleeding. In 1 of the cases the father was subject to hemorrhages; in another the pressure of the forceps produced extensive ecchymoses on the both sides of the head. We have stated in our remarks on umbilical hemorrhage that newly-born infants affected by syphilis are very liable to intestinal and other forms of hemorrhage from the dyscrasia present or from anatomical changes in the walls of the minute vessels, or, as is probable, from both causes. Our article on umbilical hemorrhage contains the statistics of Mracek, who at the autopsies of 160 syphilitic infants

¹ *Medical Times and Gaz.*, Oct., 1880.

observed internal hemorrhages in 42, but in only 4 of these was extravasated blood present in the intestines.

But the majority of the neonati who have gastro-intestinal hemorrhage do not appear to have any inherited dyscrasia or taint of system. Certainly the instances are exceptional in which the infants belong to families of "bleeders" or have the syphilitic dyscrasia. We must look for other causes apart from these. Billard attributes melæna of the newly-born to congestion of the vessels. Says he: "I have examined 15 cases of passive intestinal hemorrhage. . . . Most of them were remarkable for the plethoric condition of their bodies and the general congestion of their integuments. . . . In all the large abdominal vessels, the liver, spleen, lungs, and heart were considerably engorged with blood." He adds: "It cannot be too strongly recommended to accoucheurs to allow the umbilical cord to bleed when a child is observed to be in a state of asphyxia; for it has already been seen what serious effects follow from a superabundance of blood in young infants."¹ Vogel says: "The turgescence of the mesenteric arteries and their systems of capillaries, seen even in the physiological state, and produced by the sudden closure of the umbilical arteries, so important in the fœtus, and which arise directly from the hypogastric arteries, may be looked upon as a cause of this disease. An especial thinness of the walls or friability of the affected system of vessels must certainly play a part here, because otherwise this, in reality, very rare form of hemorrhage would have to occur much more frequently. The closure of the ductus venosus Arantii, and especially that of the branch of the umbilical vein opening into the portal vein, deserves more frequent and stricter investigation to explain this hemorrhage."

Rilliet and Barthez attach but little importance to the causes of melæna assigned by writers who preceded them, but state that it is easy to conceive that hyperæmia of the intestinal tube, which is normal in the newly-born, might be increased by atony of the vessels or impeded abdominal circulation, through arrest of the circulation in the portal vein, so that hemorrhage would be liable to occur. Incomplete establishment of respiration, in which congestion of organs occurs, and especially of the intestines, they regard as a predisposing cause. They admit hereditary influence in certain cases, as when a parent has been subject to hemorrhage. M. Bouehut² makes three groups of cases of melæna, according to the supposed etiology, as follows: First, melæna from purpura; second, from passive congestion, the result of compression at birth; third, from acute or chronic inflammation of the gastro-intestinal surface. Dr. West believes that tedious and difficult labor, in which the head of the child is compressed and abdomen injured, is an

¹ *Treatise on the Diseases of Infants.*

² *Traité pratique des Maladies des Nouveaux-nés.*

occasional cause of intestinal hemorrhage. The tardy and difficult establishment of respiration he also thinks may be a predisposing cause, but he adds, "very often no reason can be assigned for it." In two post-mortem examinations which he made no adequate cause was discovered. Braun¹ mentions among the probable causes, congestion of mesenteric vessels, pressure during birth, heredity, intra-uterine malnutrition. Steiner² believes that intestinal hemorrhage occurs sometimes from a round perforating ulcer due to fatty degeneration of the arteries. Hecker, Buhl, Spiegelberg, and Leopold Landau relate cases, six in all, in which abscesses or ulcers were observed in the stomach or duodenum, or in both. Landau expresses the opinion that these lesions occurring in the gastro-duodenal surface are produced by small embolisms. Reinbold³ relates the case of an infant born May 15th, who had hæmatemesis and melæna on the first day, and died May 17th. There was apparently epigastric tenderness. All the organs were anæmic, and the stomach contained seven or eight ulcers with edges slightly raised. No emboli could be discovered, but the umbilical vein contained a brownish-red clot.

On the other hand, J. Halliday Croom, lecturer on midwifery and diseases of women at the School of Medicine, Edinburgh, made the autopsy of a child that died of melæna at the age of half a day. The gastro-intestinal surface was carefully examined, and no abscess, ulcer, or erosion was discovered, but some congestion was observed in the lower part of the intestine. He alludes to another case, described by Helmbrecht, in which the only apparent morbid condition was congestion of the rectum. In another case, observed by Dr. Croom, an infant of three weeks, previously well, died of hæmatemesis and melæna. Both auricles contained firm clots, and in the aorta was a clot partly decolorized. The only abnormal appearance in the digestive tract was capillary injection of the duodenal surface.⁴

Epstein of Prague⁵ in an interesting monograph on melæna neonatorum states that hemorrhage occurs in the newly-born from various causes—from disturbance of the circulation leading to congestion, from disease of the vessels, and from disease of the blood itself. In infants born partly asphyxiated after tedious labor, or in weakly infants with atelectasis, Epstein says that hyperæmia, hemorrhagic erosions, ulcerations, and actual hemorrhage of the gastro-intestinal surface are likely to occur. He believes that the most common cause of melæna is temporary congestion of the finer capillary vessels. When the surface of the stomach has been sprinkled with ecchymoses, small gastric ulcers have been present, caused by emboli in the gastro-duodenal vessels resulting from thrombi in the umbilical vein.

¹ *Compendium des Kinderheilkunde*, Vienna, 1871. ² *Diseases of Children*.

³ *Deutsche med. Woch.*, No. 28, 1881.

⁴ *Med. Times and Gaz.*, Oct., 1880.

⁵ *Allgem. Wien. Med. Zeit.*, No. 49, 1882.

From the above quite numerous observations we are able to affirm that hemorrhage from the stomach and intestines in the newly-born occurs from different causes, prominent among which are—1st, hæmophilia; 2d, inherited syphilis; 3d, congestion of the gastro-intestinal surface; 4th, ulcers occurring especially in the stomach, whether produced by emboli resulting from thrombosis in the umbilical vein or from other causes.

Diagnosis; Prognosis.—If the infant vomit blood, the nipple of the mother or wet-nurse should be inspected, for a considerable amount of blood is sometimes drawn by suction from the nipple. If no abrasion or sore be discovered upon or around the nipple or upon the lips or in the mouth of the infant, we may assume that hemorrhage is occurring from the stomach or upper part of the intestines of the infant. The presence of blood upon the diaper without any fissure upon the anus or external source of its occurrence is evidence of intestinal hemorrhage. The blood is dark and more or less changed by digestion or the action of the intestinal secretions if it have lain some time in the intestines. The pallor of the infant and increasing feebleness are evidence of the loss of blood. But in one instance myself and two other physicians were deceived by a midwife who had loosely ligated the umbilical cord, so that fatal hemorrhage occurred from it. The case was reported as one of intestinal hemorrhage, and was recorded as such in the statistics of the Health Board. The source of the hemorrhage was ascertained by a post-mortem examination which we were fortunate in obtaining. The gastro-intestinal surface was normal except its extreme bloodlessness and pallor.

The *prognosis* is in most instances unfavorable, but if the infant be strong and the amount of hemorrhage small, we may hold out some encouragement of a favorable result. It is possible, indeed, that a considerable amount of blood be lost and the infant recover. But weakly infants who have an abundant hemorrhage sink rapidly. If the bleeding do not cease in twenty-four hours, death will probably be the result.

Treatment.—The child should be nourished at the breast if possible, and a little ice-water be given with a spoon along with the breast milk. If the infant do not have breast milk, peptonized milk may be employed. The food of whatever kind should be given cool. It has been recommended to apply the ice-bag over the abdomen while warm applications are made to the extremities. One grain of tannic or gallic acid dissolved in cool water may be given every hour, or one or two drops of turpentine. If the child exhibit signs of failing strength, a few drops of brandy should be given at short intervals in cold peptonized milk.

DIARRHŒA.

The colostrum, or the first secretion of the mammary glands after parturition, contains more oily matter and sugar than occur in the subsequent secretion. In consequence of this peculiarity in its composition the colostrum has a laxative effect by which the meconium is expelled. If the mammary glands continue to secrete colostrum after the first week, diarrhœa is likely to result. A more common cause of diarrhœa of the newly-born is the employment of various sweetened mixtures by mothers or nurses in the belief that the breast milk is inadequate, or they are employed for the purpose of relieving the supposed colicky pains whenever the baby frets. Cane-sugar added to the various mint teas not only gives rise to diarrhœa, but also in time to more or less gastro-intestinal catarrh and stomatitis, with the occurrence of sprue. Sprue is more common in the newly-born than at any other period of life, and it can usually, according to my experience, be traced to the use of improper sweetened mixtures. The infant immediately after birth may be given a little sweetened water or a teaspoonful of sweet oil to aid in the expulsion of the meconium, but subsequently, in the great majority of cases, no carminative or nutritive mixtures are required. The breasts of the mother if she have the usual health furnish all that is needed. The neonatus requires almost no nutriment during the first three days, and the breasts furnish but little during this time, but frequent traction upon the nipple promotes the mammary secretion, and after the third day, in ordinary cases, sufficient nutriment is obtained from the breasts to supply the wants of the system and promote a healthy growth. If what is natural were left to itself, and no artificial measures were employed, the result in most instances would be good; but the unfortunate practice of filling the infant's stomach with various admixtures disturbs normal digestion, impairs the appetite, causes colicky pains, vomiting, and diarrhœa, and, if persisted in, gastro-intestinal catarrh. The late Dr. James Jackson of Boston drew attention to the diarrhœa of young infants produced by the cause which we have mentioned. In the cases which he observed the green fermenting and unhealthy stools ceased and a more normal state of the digestive apparatus was produced by forbidding the use of the superfluous and injurious food and drinks which had been given to supplement lactation in the mistaken belief that more food was required. Food in excess, even if it be of the proper quality, even if it be breast milk, usually causes diarrhœa if it be not vomited, since, not being fully digested, it undergoes fermentative changes, and acts as an irritant until it is expelled. But food containing a large proportion of sugar is laxative in consequence of the sugar.

Diarrhœa in the newly-born, whatever its cause, should be immedi-

ately arrested. After the meconium is removed by the action of the colostrum, three daily evacuations from the bowels are sufficient. A larger number is usually attended with loss of flesh and strength. The use of sweetened mixtures, which nurses are in the habit of administering when infants are not well, as catnip, fennel, or aniseed tea, we repeat, must be strictly forbidden. A mother with a sick and fretful infant usually applies it to the breast too frequently, even every half hour during the day. This should also be strictly forbidden. The infant, like the adult, should take food at stated intervals, so that the digestive organs may have some respite from the task of digestion. The application of the infant to the breast twelve times in twenty-four hours is sufficient for its nutrition, and the mother's health is better preserved and her milk of better quality than when she is deprived of the needed rest by more frequent suckling. If the infant be unfortunately deprived of breast milk and be bottle-fed, the utmost care is required in the selection and preparation of the food, as well as in determining the amount of food to be given and the frequency of feeding. Facts relating to this important subject have been presented in preceding pages. Young bottle-fed infants with too frequent and unhealthy stools sometimes do well with peptonized milk, especially if flour prepared by long boiling be added to it. In New York City some of the shops contain barley flour subjected to the heat of boiling water seven days, and wheat flour five days, designed for nursery use. The important advantage possessed by this flour is that its starch is converted into the soluble form, and a considerable part of it into dextrin, so that it can apparently be digested by young infants more readily than ordinary flour. A teaspoonful of either of these flours may be added to twenty teaspoonfuls of peptonized milk for young infants with diarrhœa. The beneficial effect of the flour is due largely to its mechanical action in separating the particles of casein, so that they can be acted on more readily by the gastric juice, which in young infants is secreted in small quantity. Sometimes in treating the diarrhœa of young infants, if it be severe, it is better to withhold entirely milk in any form a few days, and give in its place a light gruel prepared by adding the barley or wheat flour to water in the proportion of one to sixteen or twenty. When it is heated to the boiling-point to destroy any microbes in the water, place it upon ice or in cool water, and when its temperature is reduced below blood-heat the white of an egg or half an egg may be added with sufficient salt. This farinaceous diet sometimes aids materially in checking the diarrhœa. Dextrin can be digested by the youngest infant, and the little patient may be sufficiently nourished for a week or more by the wheat or barley flour prepared in the manner stated above, with the salt and perhaps white of egg added.

If the diarrhœa do not cease by the use of the proper diet given in

suitable quantity at proper intervals, which should not be oftener than two and a half to three hours, medicinal treatment is needed. I have found the following prescriptions very useful for the diarrhoea of infants under the age of one month, as well as for those that are older :

R \bar{y} . Bismuthi subnitrat., \mathfrak{z} ij ;
Pepsini puri in lamellis, \mathfrak{z} j. Misce.

Give as much as goes on a ten-cent piece before each feeding.

R \bar{y} . Bismuthi subnitrat., \mathfrak{z} ij ;
Misturæ cretæ, \mathfrak{z} ij. Misce.

Shake bottle, and give twenty drops midway between the feedings to a child of two weeks. This alkaline mixture neutralizes the lactic, butyric, or other injurious acid which may exist in excess in the stomach or intestines. In some instances one or two drops of paregoric, given three or four times daily, have a salutary effect in diminishing the peristalsis.

CONSTIPATION.

In the infant constipation results from several different causes. The most serious and obstinate form of it, to which the term obstipation is more appropriately applied, arises from intestinal malformations. In rare instances congenital obstruction occurs in the small intestines. It is sometimes produced by cystic tumors or twisting of the intestine. Congenital stenosis occasionally occurs at the ileo-cæcal orifice. Thus in the *Transactions of the London Pathological Society* for 1870 is the history of a case in which there was such narrowing of the ileo-cæcal orifice, believed to be congenital that a No. 9 catheter could barely be passed through it. The patient lived until his thirty-second year, but throughout his life suffered from constipation and colic. After his death the ileum next to the ileo-cæcal valve was found to have a diameter of seven inches, while the large intestine was much atrophied and its entire lumen contracted from disuse. Occasionally the stenosis occurs a little above the ileo-cæcal orifice, and rarely in the duodenum at the point of union of the pancreatic or bile-duct with the intestine. The obstacle in some instances appears to be hypertrophied valvulæ conniventes, the edges of two opposite folds being more or less adherent. Such congenital intestinal obstructions—whether, as is probable, produced by inflammations in the fœtus or from simple perverted nutrition ; whether arising from the syphilitic cachexia or other cause—of course retard the evacuations according to their location and the amount of closure. The same degree of stenosis in the colon or rectum obviously

causes a more constipating effect than in the small intestines, since the latter have more mobility than the former, and their contents are more liquid.

But the most common of the congenital obstructions in the intestines occur from malformations of the rectum. These malformations vary considerably in different cases. They may be classified in at least four different groups: 1st. The anus may appear normal, but instead of the normal rectum two cul-de-sacs are present, representing the upper and lower ends of the rectum, and connected by an occluded segment of the rectum or by a firm fibrous cord. 2d. The anus is absent, and the rectum has a fistulous opening in the perineum, or through the scrotum in the male or vulva in the female. In the embryonic development the outlet of the rectum was formed too near and encroached upon the sexual apparatus. 3d. The anus is absent, and there is no external fistulous opening representing the anus, but the rectum opens at some point upon the mucous membrane of the genito-urinary apparatus. 4th. Anus absent and the entire lower part of the rectum obliterated. The upper portion of the rectum terminates in a cul-de-sac in the neighborhood of the promontory. Some of these malformations do not prevent the discharge of fecal matter, but when there is closure of the rectum and no fistulous opening, of course no evacuation of the intestines can occur unless relief be obtained by surgical measures. In the ordinary form of occlusion a portion of the rectum is represented by a cord, or a firm, unyielding septum shuts off the lower part of the rectum from that above, so that defecation is impossible. The infant with this serious malformation takes the breast for a time like other infants, but the intestines soon become distended with fecal matter, and restlessness from the distension and vomiting occur. The only mode of relief is by an incision or puncture through the obstruction; but a large proportion of infants with this obstructive malformation die whether operated on or not. The incision or puncture should be made as soon as the obstruction is discovered, and if successful in reaching the distended intestine above the malformation, the passage thus made should be kept open by tubing of the proper size if the infant live. If the operation be unsuccessful in releasing the imprisoned fecal matter, an artificial anus may be made on the left or right side. But operative measures in these cases pertain to surgery, rather than to midwifery practice.

The great length of the sigmoid flexure in infancy, and the curvatures which occur in consequence, more in number than in older children, tend to retard the descent of fecal matter and promote constipation. In the adult numerous depressions and inequalities in the colon retard the downward movement of the intestinal contents, but in infancy the surface of the colon is comparatively smooth and even, and the detention,

so far as any exists, occurs from the curvatures or loops, which are sometimes twisted partially on their axes. The sigmoid flexure is so long under the age of ten, and especially of six months, that the curvatures usually lie in part to the right of the median line, and even in the right iliac fossa. Those who have witnessed the post-mortem examinations of young infants in the asylums find no difficulty in accepting the statement of certain writers that the curvatures or loops in the sigmoid flexure, which sometimes extend as high as the umbilicus, and laterally to the right iliac fossa, cause habitual constipation.

Occasionally in young infants, as well as in those who are older, the intestines act sluggishly from insufficiency of food. Thus the infant sometimes hangs an unusually long time on the breast, and the mother or wet-nurse believes it to be a hearty nurser, when there is really a deficiency of milk, and the stools are scanty and infrequent from lack of material: under such circumstances the infant is restless when away from the breast, or, not being fed, loses flesh, and soon has the appearance of one in ill-health. These symptoms disappear by a more liberal allowance of food of proper quality. Thus, recently a young infant was brought to me suffering from constipation and fretfulness, with progressive loss of flesh and strength and with abundant urination. Its only food, prepared through the advice of a physician, consisted of a teaspoonful of condensed milk to one pint of water. By a more liberal supply of food the constipation disappeared.

Again, a constipated state of the bowels occasionally occurs in infants who nurse heartily and seem to obtain a sufficient quantity of milk; and the cause of it appears to be in the state of the digestive organs, and not in the milk. We find now and then that breast milk has a constipating effect, although we discover nothing to cause this result in the mother's diet or health. The comparison of ordinary breast milk with colostrum may furnish an explanation of the constipation under such circumstances. Colostrum is known to be more laxative than ordinary milk, and it differs from it chemically in containing more butter, sugar, and salts. Hence the theory seems plausible that when breast milk is constipating these elements occur in less than the normal quantity, and we will find that treatment suggested by this theory tends to obviate the constipation.

Constipation has also been attributed to a deficiency in the intestinal secretions and to too great viscosity of them from lack of water. Deficient peristalsis, whether from congenital weakness or other cause, also leads to constipation. The use of starchy foods without sugar or with but little sugar also sometimes has a constipating effect.

Gantier of Geneva, Switzerland, states that an anal fissure is a common cause of constipation whether in the newly-born or older infants. If such a fissure be present, pain in defecation might instinctively lead

the infant to resist the desire to evacuate the bowels and to postpone the act, so as to establish a constipated habit; but if such fissures are common in this country, except in the syphilitic, they have escaped our notice.

Finally, constipation has a tendency to perpetuate itself, since retained feculent matter becomes more consistent and firmer, and the contractile power of the muscular tissue becomes weakened by over-distension.

Symptoms.—When there is a mechanical cause of scanty and infrequent defecation, the acuteness of the symptoms and the suffering are usually proportionate to the degree of obstruction. In cases of complete obstruction of the intestines, as in imperforate rectum, fecal accumulation occurs above the obstruction. Under such circumstances distension of the abdomen, vomiting, fretfulness apparently from the abdominal pain, and progressive loss of flesh and strength, indicate the serious nature of the disease.

In constipation from other causes—that is, without obstruction except such as arises from fecal accumulation—the condition of the infant may attract little attention at first; but if it do not have proper evacuations it soon begins to suffer in its health. Fretfulness, an unhealthy physiognomy, vomiting and more or less fever occur, until the patient is relieved of the ailment.

A beautiful and conservative provision in the system is that by which vicarious functions are established to relieve organs which imperfectly perform their part. While the intestinal surface is to a great degree eliminative, so that noxious and effete products are expelled from the system in the stools, it possesses also in a high degree an absorbent function, as all who employ rectal alimentation are aware. If the intestine fail to perform its function of defecation, so that feculent matter collects within it and begins to exert pressure on the intestinal surface, more or less of the liquid portion is taken up by the absorbents, and, entering the general circulation, it finds a mode of escape through other emunctories. The general ill-health or languor, the furred tongue, foul breath, and pain in the head which characterize these cases are no doubt due to the absorption into the blood of noxious products derived from retained feculent matter. But cases to which this description is applicable are not common in early infancy. In the infant the retention is often only in the rectum or rectum and sigmoid flexure, and the symptoms are mild and are relieved by free evacuations which are easily obtained. Between these mild cases and the graver forms of constipation, such as result from mechanical obstructions, there is every intermediate grade, attended by symptoms proportionately severe.

Treatment.—It is very important that constipation in the infant should be detected and promptly treated. Not only its present health, but future well-being, requires this, for the longer the constipated habit

continues the more difficult is the cure; and an examination of the records of extreme constipation in adult life which are found in medical literature reveals the fact that in many instances the sluggish state of the intestines commenced in early infancy. The following case, observed by Renaudin and related by Dr. Copland in his *Medical Dictionary*, may be given as an example: A medical officer in the French service had been constipated from birth. He ate like others, but habitually had only one stool in a month or two months, and at the age of forty-two three to four months elapsed between the evacuations. His abdomen was greatly distended and painful, and he seldom passed more than four to six stools in the year; but he lived until the age of fifty-four years. After his death the constipation was found to be due to a fibrous but incomplete septum only one inch above the anus, the result, apparently, of a malformation in the fœtal development. Even when no malformation is present constipation in adult life can frequently be traced back to infancy.

Usually it is best to commence the treatment of constipation by an enema, which softens and removes the hardened masses which have collected in the rectum and the adjacent part of the large intestine. For a young infant tepid water or tepid water containing a little soap or salt usually suffices to produce an evacuation. No possible harm can result from rectal injections when properly employed; and as they commonly act promptly, without causing pain and without any depressing effect, they constitute an important part of the treatment in all forms of constipation. I have sometimes, in cases of habitual constipation, ordered for young infants the daily injection of three teaspoonfuls of sweet oil and one of castor oil. Injections should always be prescribed instead of medicine by the mouth when there is reason to believe that the cause of the constipation is mechanical, as from the great length and many loops in the sigmoid flexure. There are cases of constipation from this cause for which injections should be employed daily for many months, and if given gently, with a proper lubricated instrument, they ultimately give complete relief, and without producing any injurious effect. One of the meat broths or a gruel of some farinaceous substance may sometimes be advantageously employed for the same purpose.

In the common forms of constipation, in which the cause is feeble peristalsis or scanty intestinal secretions or the use of food of too constipating a nature, we should endeavor to render the ingesta more laxative. Prof. Jacobi has recommended for this condition to give a lump of sugar dissolved in water at each nursing. I have employed the sugar of milk, given in half-teaspoonful doses, to young infants also at each nursing, or several times through the day if required. Manna dissolved in hot water is also an old remedy for the same purpose.

Glucose, into which starch is converted in the process of digestion and also by the action of the diastase of malt, is also laxative. The various foods of the shops which contain glucose derived from barley or other flour by the agency of malt, employed as directed by the late Baron Liebig, are therefore useful in the treatment of habitual constipation in infants. Of four constipated infants in the New York Infant Asylum to whom Horlick's "sugar of malt" was given, three were relieved. Any of the glucose preparations can be given quite freely to a constipated infant without impairing the digestive function or producing other ill-effect, so long as no more than the normal evacuations are produced; and I consider them among the best and safest of the foods for the relief of constipation in infants. But glucose or grape-sugar is only feebly laxative; probably not more so than cane-sugar.

The ordinary purgatives should not be given habitually to relieve a constipated habit. They are likely to irritate the intestines, causing a catarrh, or else, the intestines becoming accustomed to their action, a large dose is required. If possible, the bowels should be kept open by dietetic and hygienic measures. A light oatmeal gruel, long boiled, mixed with salt and considerable sugar, given at or between the nursings, sometimes has the desired effect, especially if in addition to the salt it contain considerable sugar. We may aid in increasing the peristalsis and overcoming the constipation by the massage treatment over the bowels. The fingers lubricated with any kind of oil, should rub and knead the abdominal surface. I have seen the best results from this treatment. Cold applications over the abdomen, so highly recommended by Trousseau in adult cases, cannot be safely employed in infancy, especially in early infancy. A well-known remedy in adult cases is the use morning and evening of a tumblerful of cold water. Water may also be added in considerable quantity to the ingesta of the constipated infant.

Although, as stated above, we deprecate the necessity of using habitually purgative medicines for constipation, sometimes they are required, but if a laxative remedy which aids in the nutrition be prescribed, there is no objection to its use. Such a remedy is the following:

R̄. Ol. morrhuae, ʒiv;
 Aq. calcis,
 Syr. calcis lactophos., āā. ʒij.

Shake bottle and give half a teaspoonful three times daily to young infants. But this remedy, useful in some cases, in others disappoints our expectations. If it be necessary to employ one of the recognized purgatives, the safest and best in my opinion is calcined magnesia given in the following formula:

R \bar{y} . Magnesia calcinat., $\bar{3}$ j;
 Sacchari lactis, $\bar{3}$ ij. Misc.

Fifteen grains to a drachm, according to the age, may be given to infants, and repeated as may be found necessary.

The newly-born infant when in health ordinarily has about three stools daily, but one free evacuation may be sufficient. We know that the function of defecation is, to a certain extent, under the control of habit. Adults who have evacuations at a certain hour feel the need of them each day as that hour arrives. We should endeavor to encourage this habit in infancy and childhood.

ACUTE HÆMOGLOBINURIA OF THE NEWBORN (WINCKEL'S DISEASE).

Winckel¹ in 1879 experienced an endemic hæmoglobinuria in 23 children, associated with cyanosis, icterus, and hemorrhage in the different organs, with a fatal termination, on the average, in thirty-two hours. The main pathological conditions discovered after death were swelling of Peyer's patches and the mesenteric glands, discoloration of the renal pyramids, with dark lines of hæmoglobin, and fatty degeneration of important organs.

ACUTE FATTY DEGENERATION OF THE NEWBORN (BUHL'S DISEASE).

There was observed in 1861, by Buhl,² a disease of infants during the first few days of life, characterized by cyanosis, vomiting, icterus, bleeding from the umbilicus and intestines, hemorrhages in the brain, lungs, pericardium, and peritoneum, along with advanced fatty changes in the liver-cells, heart-muscle, alveolar spaces in the lungs, renal epithelium, and intestinal villi, following a parenchymatous inflammation. This disease, rare in human medicine, occurs not so infrequently in veterinary practice.³ The prognosis is unfavorable. It is not known whether a milder form of the disease exists which may end in recovery.

SCLEROMA NEONATORUM.

This is a disease of children prematurely born, of those which are ill-developed and ill-nourished, associated occasionally with syphilis or pneumonia, with fatty degeneration of the organs, or with heart defects. It is characterized by a hardening of the integument on the calves of

¹ *Geburtshülfe*, 1889.

² Hecker and v. Buhl: *Klinik der Geburtskunde*, i. 296.

³ Runge: *Krankheiten der ersten Lebensstage*.

the legs, the thighs, the buttocks, and the trunk, but not the breast. The temperature is very much below normal, the pulse is slow, the cry feeble. The explanation of the hardened and thickened skin is to be found in an œdema of the subcutaneous connective tissue. An ingenious explanation was at one time offered—that there was in these children a solidification of the palmitic acid in the subcutaneous fat, which is found in much greater proportion to the other fatty acids during infancy than in adult life.

The prognosis of the disease is in the main unfavorable. The treatment should consist in the administration of stimulants, the exhibition of as much peptonized milk as the alimentary canal can absorb—given perhaps by the system of gavage—and, above all, artificial heat, best furnished by an incubator. By this last means very gratifying results have been secured in Paris.

SURGICAL DISEASES OF EARLY CHILDHOOD.

BY STEPHEN SMITH, A. M., M. D.,

NEW YORK.

INTRODUCTORY REMARKS.

THE principles which govern the practice of surgery among children do not differ materially from those established for adults.¹ There are, however, certain peculiarities of childhood that should always be considered both in the study of the affections of that period and in the choice and application of remedial measures.

In the investigation of the affections of childhood, whether due to disease or accident, the surgeon must rely much more on observation and manipulation in arriving at a correct conclusion than in the diagnosis of similar affections in adults. The child can give no proper history of its disease, and cannot intelligibly describe its symptoms. To render observation and manipulation most useful and effective it is of the utmost importance to approach the patient in such manner as to gain his full confidence. The natural timidity of the child is intensely exaggerated by a painful disease or a severe accident, and its apprehension of being injured reaches its climax on the appearance of the surgeon. But with care and gentleness this fear, and consequent excitement, may generally be quickly overcome, and the sufferer will then exhibit the symptoms and signs by which his affection, whatever it may be, naturally expresses itself to the observer.

In childhood all of the physiological processes are more active than in later periods of life. There is, therefore, greater susceptibility to exciting and depressing causes in early life. Though the child's system quickly responds to stimulants, it as readily yields to depressants, and the fluctuations are so prompt, and often so extreme, that great care must be exercised to avoid conditions liable to induce these results. Excessive pain, long continued, and sudden loss of blood, are very depressing and fatal to child-life. But from the depression due to either cause the child quickly rallies if the effect ceases before the exhaustion is extreme. Children are also less liable than adults to diseases due to blood-poison-

¹ In preparing this article I have accordingly drawn freely upon my work on *The Principles and Practice of Operative Surgery*.

ing, as septicæmia and pyæmia, owing to the rapid elimination of the waste products of the body.

The pulse and temperature of the sick or injured child are not as indicative of the physical condition as in the adult. The pulse fluctuates from unimportant causes of stimulation or excitement, and the temperature may reach high degrees when the disease has not undergone any serious change.

The liability of children to the exanthemata must always be borne in mind. Scarlet fever has so often appeared after operations as to lead to the suggestion by Sir James Paget¹ that there is a peculiar liability to this disease after operations. It is certainly very important to inquire especially as to the exposure of the child about to be operated upon to any form of contagious disease to which it may be susceptible.

ANÆSTHETICS.

However dangerous chloroform may be, considered as an anæsthetic during operations on adults, it has uniformly given good results in children. It has many positive advantages over ether. It is agreeable to the child, and is not followed immediately by the distressing symptoms which so alarm the patient's friends when ether is employed.

ANTISEPSIS.

In the operative treatment of the surgical affections of childhood antiseptics is as important as in the adult. Powerful antiseptic remedies should, however, be used with greater caution in operations on children, owing to their more rapid absorption.

The principles which should govern in their case has thus been formulated (Hæcker):

“Abundant disinfection of the wounds by irrigation with antiseptic fluids should be practised. These fluids prevent foul putrefaction after thorough cleansing of the parts surrounding the wounds. During an operation the germs of infection should not be brought by means of the atmosphere, fingers, instruments, or any other object which comes in contact with the wound. If any are carried to it they are rendered harmless by the irrigation, and, at the same time, blood-clots and secretions from the wound are removed. Wounds which have not been under treatment till some time after the injury, and hence may have been infected, must be persistently irrigated with the stronger antiseptic solutions in all directions and in all corners and pockets: if necessary, incisions are to be made which may afterward be utilized for inserting drainage-tubes.

¹ *Clinical Lectures and Essays.*

“Perfect hæmostasis during and after the operation must be secured thus : All bleeding vessels, even the smaller ones, are seized, and ligatured with disinfected ligatures, in order to obtain union by first intention and to prevent subsequent hemorrhage.

“Free drainage and moderate compression are obtained by the use of inserted perforated rubber tubes, providing an exit for the secretions and preventing the accumulation of the same in the pockets of the wound-cavity, so-called dead spaces ; light compression is applied to aid the carrying off of the fluids of the wound and the apposition of the surfaces by means of a bandage, which must never cord.

“Union by first intention must be secured, if possible, by bringing and also maintaining the surfaces of the wound in exact contact with one another. This most rapid method of healing best protects the wound from the collection, putrefaction, and absorption of the secretions. After the removal of the blood-clots the skin should be exactly apposed by deep and superficial stitches, except where drainage-tubes open.

“An antiseptic dressing, containing antiseptic materials, is applied, in order to take up the secretions flowing from the drainage-tubes, from the clefts, or from the surfaces of the wound, as the case may be, thus preventing the decomposition of the secretions and closing the wound against putrefactive agents from without : in order that not even a small amount of blood and secretion shall reach the surface of the dressing, quite a large piece of impermeable material is placed over the first layers of the dressing, under which the secretions spread into the absorbent material, and finally (but only where very abundant) reach the surface at the edges of the dressing.

“Infrequent and cautious change of dressing is necessary in order to obtain for the wound the rest which is so important for its healing and to avoid every irritation. The dressing should not be renewed without good reason—viz. to remove the stitches and tubes, or when a high temperature points to obstruction to the exit of the secretion and to the consequent process of decomposition in the wound, or when the secretion has reached the edge of the dressing, so that it comes in contact with the atmosphere ; when the dressing is changed the wound should be touched as little as possible ; the cavity of the wound is not syringed out, except when first intention and an aseptic course have not been attained ; the tubes are tested, and, if obstruction requires, they are withdrawn and syringed out ; the edges of the wound are cleansed with moist cotton-wool and then the dressing applied.”

THE UMBILICUS.

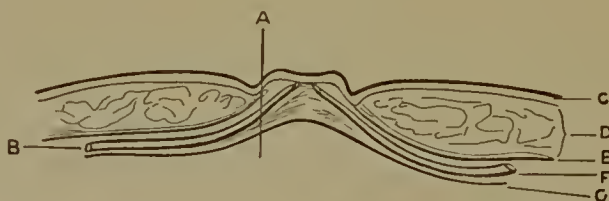
Hemorrhage from the umbilicus occasionally occurs, and may be slight or severe. If slight, it is probably caused by some local con-

dition, and will yield to compression or to styptics, as persulphate of iron, styptic cotton, or nitrate of silver. If, however, it is severe, the cause must be traced to defective circulation of the deeper vessels, as of the liver, or to changed conditions of the blood. Grandidier collected 220 cases, of which 84 had ieterus neonatorum, and 61 had petechiæ in various places.

The treatment of the latter cases by compression and styptics results in failure, and more radical measures should be early adopted. In general, the hemorrhage will be controlled by passing a needle through the mass, and applying a thread, in the form of a figure of eight, around it. If the surface from which blood escapes is large, two needles should be passed at right angles to each other, and the threads may be loosely wound around them.

Dr. Daken¹ advises to underrun the umbilical arteries with a carbolized hare-lip pin or long needle in the following way: The parts being made aseptic, the child is placed on its back, and its thighs flexed as much as is convenient; if necessary, a few inhalations of ehloroform may be given, but he has not had difficulty without it: the operator stands on the left side of the child; if the child is crying and its abdominal walls are tense, advantage must be taken of an interval when the abdomen is lax to seize between the thumb and finger of the left hand about an inch of the walls, exactly at the level of the lower edge of the umbilicus. On tightly pinching this up, the cord of the umbilical arteries (hypogastric) will be felt within the grasp. This will always happen if the operator is careful in choosing the end mentioned, as the vessels are here coming to the surface, and there is no difficulty in making the tips of the fingers and thumb meet beneath them. If the attempt be made even a quarter of an inch nearer the pubes than this, the arteries will slip away from between the finger and thumb, as they are too deep to be included in the pinch (Fig. 139).

FIG. 139.



Vertical Section through the Umbilicus and Linea Alba: *A*, level of pin; *B*, umbilical artery; *C*, skin; *D*, superficial fascia and fat; *E*, aponeurosis; *F*, umbilical vein; *G*, peritoneum.

It is easy, now they have been secured, to pass the pin beneath them, and there is no risk of wounding the intestines, as these are pushed down by the tightly-opposing finger and thumb. The hemorrhage

¹ *Lond. Lancet*, Mar. 30, 1889.

ceases directly the pin has been properly passed; if by chance it continues, a figure-of-eight ligature should be adjusted over the pin. The point of the pin is covered with a bit of cork and dry dressings applied. The pin loosens in a few days sufficiently to allow of its easy removal. It is found by experiment that the pin passes into the abdominal cavity about one-sixteenth of an inch, and hence it is not free from danger. This operation should not be resorted to until simpler methods, already mentioned, have been employed and failed.

A fistula is sometimes discovered at the umbilicus of infants, and is congenital. It is due to a patent urachus, and often discharges urine. An abscess may form in the course of the urachus, due to the partial closure, and when it finds its way to the umbilicus it opens the tube, and a fistula is the result. Any cause of obstruction to the free discharge of urine from the bladder is liable to create a urachal fistula or abscess, as phimosis, calculus, etc.

The treatment should aim to overcome any existing conditions which cause a set-back of the urine, as circumcision, phimosis, or dilatation of a narrow urethra. If the fistula is a constant outlet for pus or urine, it should not be closed; but if the discharge is slight and inconstant, a ligature may be applied to the papillary growth from which the discharge takes place, or nitric acid may be applied, or the stem may be dissected off around the opening and the wound closed with the twisted suture.

SUPERNUMERARY DIGITS.

There are four varieties of supernumerary fingers and toes:¹ (1) A deficient organ may be attached loosely or by a narrow pedicle to another

FIG. 140.



Supernumerary Little Finger.

FIG. 141.



Supernumerary Thumb.

digit or to the hand or foot (Fig. 140). (2) There may be a more or less developed organ, free at its extremity, and articulating with the

¹ Annandale: *Malformations of the Fingers and Toes*.

head or sides of a metacarpal, metatarsal, or phalangeal bone, which is common to it and another digit (Fig. 141). (3) A fully-developed organ may have its own metacarpal or metatarsal and phalangeal bones distinct. (4) There may be a more or less developed organ intimately united along its whole length to another digit, and having either an additional metacarpal or metatarsal bone of its own, or articulating with the head of one which is common to it and the other digit.

The number of these additional fingers and toes is usually one, but there may be two or more. As many as nine toes on one foot have been reported.¹ In the treatment of supernumerary digits the same rule does not apply alike to the hand and foot. In the hand they are not only a deformity, which patients insist shall be removed, but they may interfere materially with its functions. In the foot, on the contrary, the question of deformity is rarely considered, while the function of the foot may not be at all impaired. Each case must therefore be studied by itself, and a course of treatment adopted especially applicable to the conditions existing as regards function and deformity.

The first variety of supernumerary digit should be removed at an early period, whether in the hand or foot. The pedicle is readily severed, the vessels ligated, and the wound may be closed with a suture or two. In the second variety the attachment of the digit is much larger and more care is required in its removal. In addition to this, the extra digit may have a common articulation with the normal one, and in its removal the joint of the latter becomes involved in the operation. If the digit has a single articulation of its own, it must be removed with the knife by making flaps which, when united, will leave the least possible cicatrix. If the removal involves another joint, we need not now be deterred from the operation, as the joint, though opened, can be protected by antiseptics.

The third variety of deformity may or may not require to be remedied. If the position of the digit is such as not to be a decided deformity, nor to interfere with the function of the other digits, it may be better not to remove it. Otherwise, amputation should be performed. In its removal the entire digit should be taken away, with such formation of flaps as will leave the least noticeable cicatrix.

In the fourth variety we have a union of digits in such manner that the deformity may be slight or considerable, and the treatment must vary accordingly. If the supernumerary finger is bound to the other close throughout, so as not to be webbed, it must be left undisturbed or be completely dissected out of its place. If it is separated so as to form an attachment by a well-defined web, the web may be separated as will be described, and the digit allowed to remain as an independent organ.

¹ Johnstone: *Tr. Path. Soc. Lond.*, vol. ix. p. 427.

CONGENITAL UNION OF THE FINGERS AND TOES.

There are three varieties of this deformity.¹ Two or more digits may be united (1) by loose folds of skin only, the true webbed condition; (2) by a more intimate connection of the skin and deeper soft textures; (3) by the union or fusion of the bones as well as the soft textures. The union may be confined to a portion only of the extent of the digits, or it may extend their whole length.

In the treatment of this deformity it may be stated that, as a rule, no operation is useful when it occurs in the foot. In the first variety, as found in the hand, the webbed fingers must be separated. The web may attach only the ends of the fingers, in which case the operation consists simply in separating the integument uniting them and treating the wound left upon each finger. If the union extends the entire length of the fingers, a very different procedure is required, owing to the inevitable contraction of the wound, especially at the angle between the fingers. There are two methods deserving of trial. The first consists in making a permanent opening in the web at the angle of the fingers by means of a seton (Fig. 142). When the opening has so far healed that there is no liability to closure, the remaining portion of the web may be divided and the wounds healed. The seton consists of an india-rubber cord of the size of a No. 8 catheter, which is passed

FIG. 142.



Seton Inserted.

FIG. 143.



Diagram of Flaps in Operation.

FIG. 144.



Webbed Finger, with Thick Septum.

through a cannula previously carried through the web with its trocar in position. The ends of the rubber cord are to be fastened to a band around the wrist. When the opening has so far healed at its margins that it will not close, the remaining web is divided and the wounds treated for rapid union.

¹ Allingham: *op. cit.*

The second method is especially applicable to cases in which the web is thick and firm. It is as follows: Two flaps of the web are made, an anterior and a posterior, but reversed (Figs. 143, 144). For the posterior make an incision along the dorsal aspect of one finger the length of the web, and transverse incisions at either extremity to the middle of the

FIG. 145.



Operation for Webbed Finger: *a*, the lines of the two incisions uniting, so as to divide the web and leave a flap on each side; *b*, the flaps detached from the opposite finger to those to which they are adherent; *c*, the flaps applied to the fingers, and covering in the raw and exposed surfaces.

dorsum of the other finger. These incisions are to be repeated on the palmar surface, but the longitudinal incision must be repeated along the palmar surface of the finger which forms the base of the posterior flap. The two flaps thus formed are now dissected and turned backward. The two fingers should next be separated, and they will be found to have each a flap, one attached upon the dorsal and the other upon the palmar surface (Fig. 145).

The flaps are next to be applied to their respective fingers; with the union of these flaps the fingers are effectually and permanently separated.

CEPHALHÆMATOMA.

For a description of this condition see page 678.

The treatment of cephalhæmatoma should be conservative. In the great majority of cases absorption takes place. If, however, the disease remains, the cavity should be freely opened, all of the blood carefully

removed, dead tissues and granulations cut or scraped away, the internal surfaces cleansed with weak carbolic solutions, a drainage-tube introduced, and the wound accurately closed and dressed with antiseptic materials.

FIG. 146.



Pulsating Vascular Tumor of the Orbit, Eyelids, Temple, and Forehead (Bull).

PULSATING VASCULAR TUMOR OF ORBIT.

Dr. C. S. Bull of New York reported¹ a case of pulsating vascular tumor of the orbit treated by electrol-

¹ *Med. News*, Oct. 7, 1882.

ysis, with partial success. The child was about seven months old, and the tumor involved the eyelids, temple, and forehead. There were four applications when the child was lost sight of, but the hardening and condensation increased steadily as long as it was under observation.

ATRESIA ORIS.

Atresia oris is a congenital closure of the mouth by a membrane, and is allied to imperforate anus. There may also be an acquired closure due to the cicatrization of burns. If the narrowing is very great at birth, it is called *microstoma congenitum*. In either case the treatment consists in enlarging the mouth by dilatation or by a formal operation. Dilatation is adapted to cases in which the tissues are yielding without much pressure. The fingers may be used to stretch the angles, at first singly, and finally two fingers.

If the mouth is narrowed by cicatricial tissues, or if the parts are dense and unyielding, an operation must be undertaken. Lateral incisions should be made to the proper extent, and then the margins of the lips should be so shaped that the mucous membrane gives a longer flap than the skin; the former must then be turned over and attached to the latter very accurately, so as to secure immediate union. If the two margins are adjusted so as to secure union, the operation will be permanently useful. If there is a tendency to contract, dilatation must be resorted to and persisted in for a considerable period.

FIG. 147.



Cicatricial Contraction of Mouth.

FIG. 148.



Large Mouth, Pendulous Growth near Ear.

A child may have a malformation of the mouth quite the opposite of the preceding—viz. an enlargement, *macrostoma congenitum*. In this case the angles of the mouth are extended backward toward the angles of the lower jaw. The defect is due to an arrest of the process of union between the maxillary process and the first branchial arch. Or the defect may extend upward and backward toward the angle of the eye.

Treatment is most successful when the defect is the result of failure of union and there is no deficiency of tissue. The operation consists in preparing the opposing edges by dissection, so that two fresh surfaces

may be placed in accurate apposition. Hair-lip pins will generally be necessary to maintain the two portions of the cheek in proper apposition until union takes place. If there is much deficiency of tissue, a plastic operation may be devised which will meet the indications.

HARE-LIP.

Hare-lip is a congenital defect of the upper lip. The lip is formed by the union of three portions—one central, connected with the intermaxillary bones (Fig. 149), and two lateral, connected with the submaxillary bones. If union fail upon one side, there is a single hare-lip; if on both sides, the hare-lip is double. The cleft corresponds with the junction of the intermaxillary bones when it is central—a very

FIG. 149.



FIG. 150.



FIG. 151.

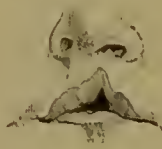


FIG. 152.



Fig. 149.—Showing Development of the Intermaxillary.

Fig. 150.—Hare-Lip, congenital cicatrix.

Fig. 151.—Hare-Lip as a slight notch.

Fig. 152.—Hare-Lip as deep fissure in right side.

rare defect—or with the intermaxillary and the maxillary bones when it is lateral. The cleft may be a slight cicatrix (Fig. 150), or a mere notch (Fig. 151), or it may involve the entire lip (Fig. 152), or it may be double (Fig. 153), or, finally, it may be complicated with a more or

FIG. 154.



FIG. 155.



FIG. 153.



Fig. 153.—Uncomplicated Double Hare-Lip.

Fig. 154.—Fissure of Hard and Soft Palate.

Fig. 155.—Hare-Lip complicated with Fissure of Alveolus and Projection of Intermaxillary Bone, the palate being perfect.

less extensive non-union of the bones (Fig. 154). In some cases there is a double hare-lip with non-union of the intermaxillary bones, which seriously complicates the defect (Fig. 155).

The period of operating is important. If the infant is robust and the hare-lip simple, the operation may safely be performed immediately. Unless, however, there is special urgency, it is better to delay for several days, even in the simplest form of hare-lip. If the child is feeble, the operation should be delayed until the third or fourth month. If we are governed by the mortality after the operation, we should fix the period of least danger at from three to six months. In cases where the infant cannot take food easily, an early operation may be a necessity if all of the conditions are favorable. If the case is one of double hare-lip or is complicated with clefts of the hard palate, it is better to wait until the child is two or three years old, unless the difficulty of taking food renders an immediate operation necessary. The operation should never be attempted while the child is suffering from any disturbing cause, as diarrhoea or an eruptive disease.

If the operation is delayed from any cause, great care should be taken to secure proper nourishment of the child. In general, infants suffering from hare-lip, except in the slightest form, are not well nourished. They are liable to be feeble, have little endurance, and in some instances emaciate and die of exhaustion. The mother's milk is the best if she is in health, and the infant should be supplied with it, even if it must first be drawn from the breast with a pump and then fed to the child.

The operation should be planned with great care and executed with deliberation. The rule of sacrificing as little tissue as possible should always govern, whatever may be the method of procedure selected. With a little study of each case it will often be found practicable to modify to advantage the stereotyped form of operation, and especially to save tissues, which should not be sacrificed.

In very young infants it is not advisable to administer an anæsthetic. The child can be readily held by assistants, and it is well to avoid the depressing effects of the drug. If the child is a year or two old, chloroform should be employed.

If the patient is an infant, the best position in which it can be placed is sitting in the lap of the nurse. It should first be wrapped in a sheet, so that its arms are well secured, and then be firmly held by an experienced assistant, while its head is well supported by a second assistant (Figs. 156, 157). If the child is two or three years old and takes chloroform, it is better to wrap it in a sheet and lay it on a suitable table. The table should be placed in a good light, and all of the arrangements made for an antiseptic operation. If the patient lies on a table, the operator may stand at the head.

It is important to prevent the loss of blood during the operation, for, unless precautions are taken beforehand, there is liable to be a flow from the cut surfaces which does not attract attention until a dangerous amount of blood is lost. The thumbs and fingers of an assistant

grasping the lip on either side of the cleft are usually the most reliable agents for compressing the vessels. If an assistant cannot be relied on, ring forceps may be used as compressors, the handles being

FIG. 156.



Operation for Hare-Lip, position for infant.

FIG. 157.



Elastic Compressor applied over Coronary Artery.

controlled by a rubber ring, and the degree of compression by the position of the rubber ring.

Whatever may be the method of operating, the first step should be to free the lip from all attachments, so that the flaps will move freely. To effect this object, the lip should be raised and put on the stretch. By this act the attachments of the mucous membrane are seen, and they should be incised at their reflection from the lip to the gum, so as to admit of the freest movement of the sides of the cleft. The closure of the wound must be by the hare-lip pin, unless the case is one in which there is no strain or considerable tension. This pin should be of steel, very fine, and of sufficient length to leave projecting on each side an inch to an inch and a half of the shaft. It should be entered at least one-third of an inch from the margin of the cleft, and be carried obliquely through the flap to the margin of the mucous membrane, but not through it. The needle should next traverse the wound, enter the margin of the mucous membrane of the opposite side, and then pass through the flap, emerging at a point at the same distance from the margin of the cleft as it entered on the opposite side. The mucous membrane is not punctured. The two flaps are now nicely adjusted, and a silk thread passed around so as to form a figure-of-eight (Fig. 158). If two pins are used the turns of the thread may include both (Fig. 159).

Additional sutures should be employed to secure the margins of

the wound. The best material is horse-hair softened, though fine silver wire answers a good purpose. A sufficient number should be used to accurately adjust the wound, but at the border especial care must be taken to apply the sutures, so as to give exactness to the flaps. It is necessary also when completing the sutures to evert the

FIG. 158.



Application of Twisted Suture.

FIG. 159.



Twisted Suture.

lip gently, and if there is a point where the wound is gaping posteriorly, one or more sutures should be inserted: this prevents irritation of the wound by saliva or food. The ends of the pin or pins should now be cut off with sharp snippers, and a piece of lint placed under the end of each, so as to prevent its penetrating the skin when straps are applied.

After the sutures are adjusted the two flaps must be well supported, either by a truss (a very convenient appliance) or by straps. The truss (Fig. 160) brings the cheeks well forward, and leaves the wound open for examination.

FIG. 160.



Hainsby's Truss.

If straps are employed, they should be the adhesive rubber plaster, cut so as to have one broad end for the cheek and a narrow portion over the lip to the opposite cheek. Two of these applied, the wide part to the opposite cheeks, are sufficient. The cheeks should be drawn well forward before the narrow portion is laid over the lip, in order to relieve all tension on the wound. The pin should not be covered.

To avoid the scar of the pin, it should be removed within forty-eight hours. On attempting its removal seize one end with forceps and slightly rotate it, so as to loosen its connections: then withdraw it, while with the other hand the parts are maintained firmly.

If the case has progressed favorably, the dressing should be very carefully removed. For this purpose warm bichloride solution, 1:2000, should be employed. The dressings should, as far as possible, be removed without any force, by wetting with the solution. If at any point union has failed, care must be taken to support the flaps in proper contact in order to secure union by granulations. Good results may be

obtained by securing such union when the failure of immediate union extends throughout a considerable portion of the wound.

During the period required for the operation the child must be well nourished by feeding. The mother's milk should be taken from the breast artificially and fed to it. An œsophageal tube has been used for feeding. In about one week, if the case has done well, the child may be allowed to begin nursing.

Fissure of the lip, the simplest form of cleft, requires a method of operating quite different from other forms. In this case there is no necessity of cutting away any part of the cleft. On the contrary, the material is so scant as to make it desirable to increase the tissue. This is ingeniously accomplished by Nélaton's operation. Two incisions

FIG. 161.



FIG. 162.



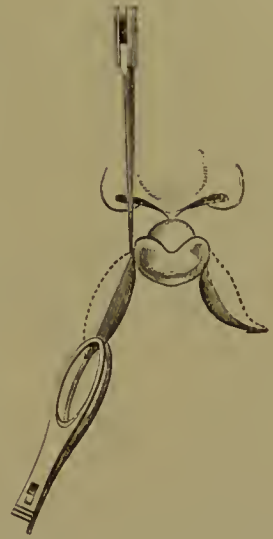
Nélaton's Operation for Partial Hare-Lip.

are made through the whole thickness of the lip which meet at a point above the tip of the fissure, and extend laterally parallel with the sides of the fissure (Fig. 161). The extent of these lateral incisions should be governed by the depth of the fissure. They should not involve the free margin at any point, but should leave two substantial flaps. The double flap thus formed is then depressed, the former apex of the cleft presenting downward, while the open wound assumes a diamond shape (Fig. 162). The wound should be closed by a single hare-lip pin passed through the widest part of the wound, now the angles formed by the depression of the double flap. When the wound is closed the apex of the flap projects considerably beyond the natural margin of the lip. This projecting tip of marginal tissue, though quite unsightly at first, gradually contracts, and as the cicatrix undergoes the ordinary changes in the process of complete repair the margin of the lip becomes even, with little or no appearance of deformity. If any projecting mass remains, after two or three years, which is unsightly, it may be removed by a slight operation.

Single hare-lip may occur on either side, and may vary in extent, involving but a part or the entire depth of the lip. In the selection of the method of operating the aim should be not only to secure well-adjusted flaps, but to avoid a depression at the point of union at the margin of the lip. By some methods the depression of the lip at this point becomes a decided deformity which must afterward be remedied.

Several methods have been practised to accomplish that purpose. The first and usual method is the old operation, which consists in cutting away a portion of each flap by curved incisions, with the concavity toward the fissure. The lip is seized with fine-toothed forceps at the lower edge of the cleft, and the part is put on the stretch. With a narrow knife the flap is transfixed above, and a curved incision is made downward, first along the external and then along the internal cleft (Fig. 163). On uniting these flaps the margin of the lip protrudes at their junction, thus avoiding a cleft or depression. Nélaton's operation is best adapted to clefts that do not involve the entire lip into the nostril. The result of this operation on a complete cleft is seen in Fig. 164. The simple operation of Malgaigne effects the same object. The incision is carried along the fissure until it reaches the red border, when it is turned rather abruptly toward the cleft. This method saves some of the border of the lip, and when the flaps are united creates a projection at the point of union at the border (Fig. 165). The operation of Collis in large single clefts is on the principle of saving the "parings" as far as possible. This operation is performed as follows: Make an incision from *A* to *B* (Fig. 166) through the thickness of the lip, down to the mucous membrane, but not through it, and turn the flap back. On the opposite side transfix the lip at *C*, and separate a flap as far as *D*, dividing it at *E*. The two sides are now brought together; the flap *CE* is turned upward and the point *E* is attached to *A* by a suture.

FIG. 163.



Operation for Double Hare-lip. Right side of lip drawn down by spring-hook forceps; long narrow knife entered at angle; dotted line shows direction of the incisions.

FIG. 164.



FIG. 165.



FIG. 166.



FIG. 167.



Fig. 164.—Malgaigne's Operation for Hare-Lip.

Fig. 165.—Operation for Single Hare-Lip.

Figs. 166 and 167.—Collis' Operation for Hare-Lip.

The flap *ED* is turned downward, and the point *E* is attached by suture to *B*. Two or three intermediate sutures should be applied. The effect of this operation is to prevent the slight notch by the flap *ED*, to form a mucous surface for the nostril by the flap *EB*, and, finally, by turning

the flap *AB* backward, to double the thickness of the cicatrix. The result is seen in Fig. 167.

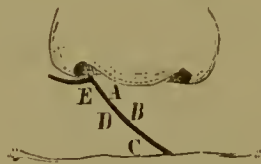
If the cleft is symmetrical, an operation resembling that known as Nélaton's may be performed (Fig. 161). It is, however, especially adapted to cases where the cleft does not pass into the cavity of the nostril.

If the cleft is very large, the method of Giraldès will probably give the best results (Fig. 168). The flaps *C* and *A* are made on either side, so as to save all tissue. The incision on the right side extends from *E*

FIG. 168.



FIG. 169.

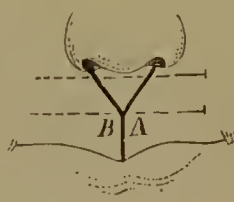


Hare-Lip: Giraldès' Method.

to *D*, and that on the left side from *B* to and including the margin of the lip. An additional incision is made from *E* upward and outward under the nose. The union of these flaps is seen in Fig. 169.

Double hare-lip may exist without fissure of the hard parts (Fig. 170). In this case the method of operating should be such as will tend to obliterate any central cleft. If the traction on the flaps should be great, the operation should be divided into two parts, one side being operated upon and allowed to recover before the other is undertaken. Operate thus (Figs. 170, 171): The flaps being loosened, make the incisions *A* and *B* from above downward and outward through the entire thickness of the lip. At the upper ends the flaps

FIGS. 170 and 171.



Double Hare-Lip.

are cut loose, but at the lower extremities the incisions terminate two-thirds of the distance from the borders of the lip. The central portion is next incised on both sides, but as little tissue is sacrificed as possible. The two lateral flaps are then turned downward and united at *BA*. By this union of flaps the prepared surface of the lateral edges

of the cleft are brought into contact with the incised edges of the central portion. One or two pins are necessary to secure good coaptation of the upper portions of the wound. The remainder is easily united with sutures.

The most difficult cases of hare-lip in treatment are those complicated with a non-union of the intermaxillary bone. The question always arises as to the propriety of saving the projecting mass of bone. As a rule, this bone can and should be saved. But there are cases when it is better to remove the bone, as when it is very much out of position and the child is feeble, or when it is simply a pendulous mass attached to the tip of the nose. In the slighter cases of projection of the intermaxillary bone it may only be necessary to fracture its attachment to the septum and press the mass backward into position. If the bone is too large to fill the space, the lateral surfaces must be cut away sufficiently and the adjacent sides of the superior maxillary bones refreshed.

A wedge-shaped piece may be cut from the septum, which will allow the mass to recede more readily into the cleft. In order to retain the bone in place, sutures have been applied to the sides of the notch; also silver sutures have been passed through it and the adjoining hard palate, but several teeth were destroyed by the destruction of their sacs; again, the bone has been held in position by at once uniting the clefts in the soft tissues. If the flaps are insufficient to close the space, they may

FIG. 172.



Before Operation.

FIG. 173.



Front View.

FIG. 174.

Side View
after Operation.

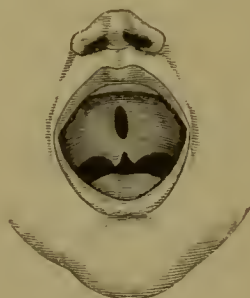
be so far dissected from the cheek as to admit of their easy approximation. The operation may be divided into stages, dealing first with the projecting intermaxillary bone, and subsequently with the soft parts.

If the mass is of such a nature as to render it desirable to remove it altogether, as when it is simply suspended from the tip of the nose, it should be carefully dissected away with scissors, retaining the soft parts in such form as to make a *columna nasi* or to fill the gap in the lip. The result is often very satisfactory.

FISSURED PALATE.

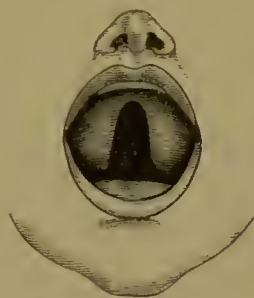
Congenital defects of the palate are very variable in extent. The intermaxillary bones may alone be separated, or the fissure may be at one or two points in the roof of the mouth, or the cleft may involve only the uvula (Fig. 175), or the fissure may involve the soft and hard palate; or, finally, the fissure may extend throughout both the

FIG. 175.



Slight Fissure.

FIG. 176.



Large Fissure.

hard and soft palates. The conditions are the same in all cases—viz. a failure of the physiological process of fusion of the bones or soft parts of the opposite sides at the points of natural junction.

The most serious result of these clefts, when extensive, is the difficulty the infant experiences in nursing. A complete fissure of the soft palate and uvula even may render the act of sucking very imperfect. The act is rendered more difficult when the fissure extends through the hard palate. It is of the first importance, therefore, to attend early to this defect as to taking food and to the child's nutrition. The tendency is to the escape of the food through the nose if the child succeeds in drawing milk from the breast or while it is being fed with a bottle or spoon. In some cases the deficiency is so great that fluids pass into the trachea, as in the instance reported by Dewees, where the child strangled severely on every attempt to take fluids. This defect can be remedied to some extent by placing the patient in a nearly upright position while it is taking food. The milk then passes into the pharynx more readily, and is at once swallowed. The child with fissure of the hard palate will take food from a bottle more easily if it is supplied with a large india-rubber nipple. By studying the peculiarities of nursing and feeding in each case many expedients for overcoming the defects will be suggested. Holmes¹ mentions a case where he admitted a child to the hospital for the operation. The parents alleged that the infant was rapidly failing from loss of nutriment, as they could not feed him without all of the fluid running out of his nose. It was found that this difficulty was due only to the awkwardness of the parents, and that

¹ *Surg. Treatment of Children's Diseases.*

under the skilful care of the hospital nurses the child throve perfectly well. ✓

In addition to the care necessary to proper nutrition by feeding, the health of the infant must be promoted by such hygienic measures and remedies as the case demands.

The age at which the operation should be performed must depend upon the extent of the cleft and upon its effect on the child's nutrition. If the operation were simple and ordinarily successful, an early closure of these clefts should be the rule, for it is very desirable that this obstacle to feeding, and subsequently to speech, should be overcome at the earliest possible period. But the operation is difficult and tedious, and its success depends upon conditions of health not easily secured for these subjects. There is liability to free hemorrhage, and hence to shock which has resulted in convulsion and death. The tissues are also tender, and do not admit of much strain on the sutures. As a rule, therefore, it is better to defer the operation until the third or fourth year, or even later in life.

HYPERTROPHY OF THE ALVEOLAR PROCESS.

Hypertrophy of the alveolar process appears as a congenital affection, and consists of an expanded and prolonged development of the alveolar borders of the maxillæ, immense thickening of the fibrous tissue of the gum, and exuberant growth of the papillary surface. When fully developed the patient presents an extraordinary appearance: a large mass, dense, inelastic, insensitive, pink, and smooth, protrudes from the mouth.

ABSENCE OF THE TONGUE.

Absence of the tongue is a very rare defect. In its place appears one or two nodules which are movable. No method has been devised of remedying the defect.

The tongue is occasionally bifid, either at the point or the split may extend backward nearly to the root of the organ. The defect is not due to a failure of two parts to unite, as in clefts of the palate, for the two halves of the tongue spring from a common centre, and not from two centres. It is alleged by Ahlfeld that in its simplest form the cleft is due to the traction of a too short frænum. The defect does not interfere with the functions of the tongue to such an extent as to make an operation necessary. If, however, an operation is desired to relieve the deformity, it may be undertaken with every prospect of success. The procedure consists in removing the opposed surfaces of the cleft, and then uniting them with suture. The hemorrhage must be controlled by ligature of any bleeding vessel; union takes place promptly.

The tongue may be adherent to the floor of the mouth. The adhesions are usually at the sides of the tongue or immediately beneath it, and consist of folds of mucous membrane. There may be but two or three, or they may extend from the tip around each side, completely binding the tongue down, or the adhesions may extend from the tongue to the lower jaw. The functions of the organ are very much interfered with, and an operation is necessary. The division of the bands must be accomplished by incision, all bleeding being promptly arrested by ligature; or, if there are but one or two bands and the child is feeble, a ligature may be passed around each and be left to separate by ulceration.

TONGUE-TIE.

Tongue-tie is of very infrequent occurrence. The popular belief in this defect is very common, and mothers often urge physicians to operate upon children in whom there is no disability. But it should always be a matter of duty to examine every case where it is alleged that the infant does not nurse properly, for tongue-tie may exist, and relief can only be obtained by a timely operation. It may be accepted as a rule that the operation is not required when the tip of the tongue can be protruded beyond the edge of the gum, or in case the finger can be passed under the tip and elevate it. It is due either to the unusual breadth of the frænum or to the extent of its attachment forward at the extremity of the organ. The effect of this condition of the frænum is seen when an effort is made to protrude the organ or to suck. The end of the tongue is firmly held down behind the alveolar process, while the dorsum is elevated instead of forming a groove, as is necessary in the act of sucking.

The operation of dividing the frænum is best performed by passing the tips of the first and second fingers of the left hand, palms downward, under the tongue and on either side of the frænum, and raising the tongue toward the roof of the mouth: by this act the frænum is put on the stretch. With blunt-pointed scissors the edge should be snipped, and such further division may be made as will give sufficient freedom to the tongue. A cut to the depth of an eighth of an inch is ordinarily sufficient. The danger in the operation is hemorrhage from a wound of one of the arteries, but these vessels are protected by the fingers placed as described.

MACROGLOSSIA.

Macroglossia, or hypertrophy of the tongue, is usually a congenital affection or appears in early infancy (Fig. 177). Butlin¹ states that "in

¹ *Diseases of the Tongue*, p. 211.

many cases in which the disease has occurred in young subjects it has followed so closely on various general and local maladies, and has appeared so clearly to owe its origin to them, that the theory of congenital origin can scarcely be maintained successfully for every case." It has been attributed to such local causes as abscess, ranula, mercurial salivation, injuries, and it has been immediately preceded by such constitutional causes as chicken-pox, scarlet fever, whooping cough, and epileptic attacks. The above author suggests that in such cases there may have been an inherited predisposition in some, if not many, of the patients.

In regard to the pathology of macroglossia, Virchow first discovered that there was dilatation of the lymph-vessels, with an increase of the connective tissue. Butlin¹ states that most authors are agreed that the diseased condition of the lymphatics is the essential element in macroglossia, and that all other changes which are observed are secondary to this. The enlargement of the blood-vessels is quite secondary in importance, and may be accounted for by the greater supply of blood which is needed for the nourishment of the hypertrophied organ.

The diagnosis in the earlier stages, while the tongue is confined to the mouth, is difficult. The organ may appear to be larger than normal, but if it does not increase in size a decided opinion could not be given. If the tongue steadily enlarges and begins to protrude from the mouth, the symptoms become more and more characteristic. The mouth remains open or is closed with difficulty; the saliva flows freely from its angles, food is swallowed with difficulty and may require to be forced back with the finger, the tongue becomes dry, and may finally fissure and ulcerate. The affection is chronic in its course, and may require years for its complete development.

Treatment is very successful, and should be early resorted to and persistently employed. In the early stages compression and astringents have proved useful. If the tongue can be maintained in the mouth, the compression of the walls of the cavity can be utilized. In this case the mouth should, as much of the time as possible, be kept firmly closed by a bandage. If the tongue protrude from the mouth, Syme's method may be employed—viz. apply lint moistened with a solution of cupric sulph. \mathfrak{Hj} , aq. \mathfrak{zj} , and bandage firmly. If these means fail, the proper treatment is excision.

FIG. 177.

Hypertrophy of
Tongue.

VASCULAR TUMOR OF THE TONGUE.

Angioma occasionally appear on the dorsum of the tongue of infants.

¹ *Op. cit.*, 207.

They are more often venous in their structure than arterial. They may be single or multiple. They are composed of numerous anastomosing vessels or they may have a cavernous structure.

They are generally situated on the anterior part of the dorsum, and project slightly above the surface. The mucous membrane becomes thin over them, and has a dull-blue or livid appearance. The mass feels tense and elastic, like a thin cyst filled with fluid. They are usually quite painless, and are seldom very large or inconvenient, except from their tendency to bleed and occasional bulk. Their life-history varies: they may disappear altogether, without leaving any trace of their former existence, or they may gradually increase in size, so as to become troublesome by interfering with eating and speech; or they may undergo warty degeneration.

The treatment should be destruction of the vascular character of the growth by the actual or galvano-cautery, the latter being preferable. If the actual cautery is used, the needles should be brought to a dull-red heat and then thrust deeply into the tumor. This operation should be repeated until the mass is thoroughly subjected to the cautery. With the galvano-cautery a dull-red heat is very easily maintained after the metal point has reached the interior of the tumor; and hence this cautery is much more readily managed, as the single point may be moved about in the interior of the growth until the entire mass is subjected to its influence.

INTESTINAL OBSTRUCTION.

Various forms of intestinal obstruction may occur in childhood.

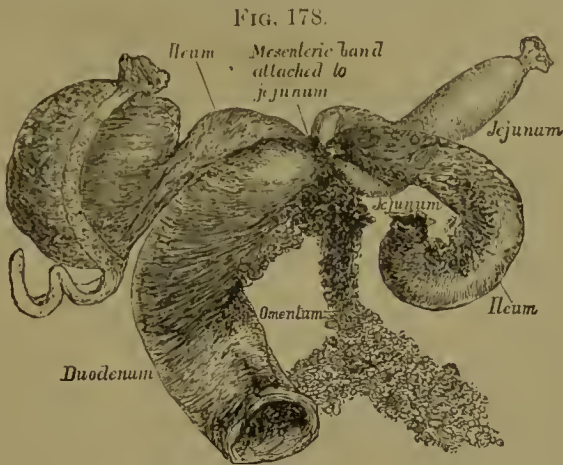
Ileus or twisting of the bowel upon itself is sometimes met with, the cause of which is unknown. The bowel may be obstructed by bands or adhesions which are the result of a former local peritonitis. In these cases we occasionally find a loop of intestine which had passed under the band and then became strangulated; or a diverticulum may have existed which by its adhesions created a band, under which the bowel passed and became fixed.

Intussusception or invagination of the intestines is the most frequent cause of obstruction. There are many causes of invagination, such as spasmodic action of the bowel from irritants, the presence of a polypus, diarrhoea, etc.

The diagnosis of the exact nature of the cause of obstruction is generally impossible, and the surgeon must approximately discriminate as to the cause by a careful study of the symptoms.

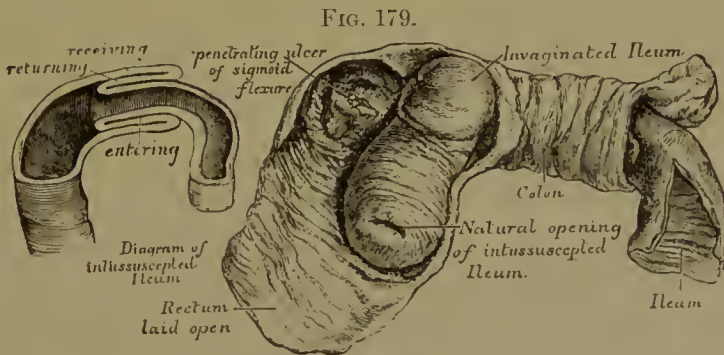
It may be stated, as a general rule, that obstruction caused by adhesions has a more or less chronic course as compared with obstruction by intussusception or a twist. In the former case the child suffers from

frequent attacks of abdominal pain, sluggish action of the bowels, indigestion with vomiting. As the constriction increases the bowels become



Case of Strangulation of the Bowel by Lymph-band constricting ileum about three inches from caecum, and a coil of jejunum.¹

distended, emaciation increases, and the presence of a hard mass may be detected through the abdominal walls, or if the obstruction is at the rectum, the left iliac region may be filled with feces.



Intussusception, with diagram showing the entering, returning, and receiving layers of ileum into colon.

Strangulation of the small intestines may be caused by peritoneal false ligaments, by the omentum and mesentery, by slits and holes in different organs, by diverticula, by the appendix vermiformis, by internal hernia, and by twisting, knotting and compression (Fig. 178).¹

Strangulation by band² occurs, with scarcely an exception, in the small intestines, and the segment involved is in the great majority of cases the lower part of the ileum : this is due to its relation to the caecum and appendix, its descent into the pelvis, and the presence of a diverticulum.

¹ T. Bryant.
VOL. II.—50

² F. Treves.

In occlusion of the jejunum, collapse, vomiting, and anuria usually appear early and soon reach a considerable height; the course is usually rapid, the meteorism inconsiderable, limited to the epigastrium, or entirely wanting, and the abdominal wall even retracted; the vomited matter is stained with bile greatly discolored, but never feculent; when the occlusion is of the lower part of the ileum, the meteorism is noteworthy, sometimes limited mainly to the meso- and hypogastrium, with comparative hollowness of the regions corresponding to the colon: the course is also rapid, collapse, vomiting, and suppression of urine appearing early, but the vomited matters soon become feculent.¹ These cases are rarely relieved by any other treatment than laparotomy. The gentlest efforts may be made by kneading the abdomen. If this fail, the operation should be performed. If bands are found, they should be tied with catgut ligature, and then divided or excised; if the bowel is twisted, it should be replaced, and, to prevent the twist recurring, sutures² may be passed through the mesentery of the bowel and the parietal peritoneum of the left abdominal wall.

Intussusception of the jejunum and ileum may occur in the infant.³ Owing to the comparative narrowness of the tube into which the invaginated portion of the bowel descends, strangulation and congestion are speedy and intense, and sloughing and separation of the strangulated part are consequently most frequent (Fig. 179).⁴ It follows that this intussusception generally runs an acute course; impermeability is immediate and permanent, and death may follow in from three to six days, with or without peritonitis or perforation; in other cases the invaginated portion sloughs, either in strips and shreds or in tubular sections, between the eleventh and twenty-first days.⁵ The general symptoms of intussusception combine a variable degree of obstruction and inflammation; the patient manifests signs of sudden, violent pain, sometimes distinctly recognized as a straining sensation, rarely accompanied by rigors; vomiting follows, which may subside if the inflammation is early and intense, but more frequently continues and becomes stercoraceous in the course of three or four days. The infant may become convulsed. The tumor caused by the intussusception is a physical sign of the greatest value; though of small size in many cases, especially in the earlier stages, and often obscured by the distension of the intestine, yet a careful examination will usually detect its presence.

The most characteristic features of intussusception of the small intestines are the violence of the symptoms, the rapid progress of the disease, more copious hemorrhage from the bowels, blood sometimes in the vomited matters, more complete obstruction, the discharges con-

¹ O. Leichtenstern.

² Roser.

³ J. L. Smith. [I have seen a fatal case at the third month.—Ed.]

⁴ J. S. Bristowe.

⁵ O. Leichtenstern.

taining little or no fecal matters, the absence of tenesmus, the tumor small and situated within the abdomen and in the right hypogastrium.¹ Sloughing and discharge of the invaginated portion occasionally occur, followed by recovery. The question of reducing the invagination demands early consideration, and must be determined with due regard to the fatality of the disease, the possibility of recovery in each individual case, with or without sloughing of the invaginated portion, and the fact that rough, forcible, ill-timed proceedings will do more harm than good.

Prof. Nothnagel² has published some interesting experiments on ligation of the intestine of animals, which throw some light on the action of the bowel after strangulation. The effect of the ligature upon peristalsis varies according to whether it is applied to a quiescent portion of intestine or to one in which a peristaltic wave is already in progress. In the former it does not give rise to tempestuous peristalsis; in the latter it does. When the ligature is tight enough to cause effectual obstruction, violent peristalsis sets in in the portion above the constriction, the contents are forced down against the stricture, and the bowel just above the ligature becomes over-distended, and at length parietic, but no antiperistalsis is observed. Fecal vomiting is accounted for by the fact that it is in the direction of the stomach that the least resistance is encountered.

The prognosis of obstruction from whatever cause is always very grave. Whatever may be the cause, the affection usually runs a rapid course, and if relief is not prompt serious complications follow, as peritonitis, rupture of the bowel, sloughing of the constricted part. It is a fact, however, that the most serious cases occasionally recover. The obstructing mass in the bowel may become dislodged, the loop of constricted intestine may slip out of its false position, and the invaginated portion of bowel may slough off and be discharged.

The treatment of obstruction of the bowels in infants requires great discretion, in which caution and yet promptness are duly combined. The patient cannot bear too active treatment, and still delay is likely to prove fatal. The most important step to be taken is in the diagnosis. If the nature and location of the obstruction are correctly made out, the course of treatment becomes at once evident; but if these features of the case remain obscure, the treatment must be involved in doubt and uncertainty.

In regard to medication, it is evident from Nothnagel's experiments that the indications point to measures capable of soothing the irritation and calming the intensified peristaltic action. Purgatives should be avoided; no food should be taken; opium should be given in large doses, preferably in the form of the crude drug, but if that is not well

¹ W. Brinton.

² *N. Y. Med. Journ.*, April 13, 1889.

borne by the stomach, morphine may be used subcutaneously. Warm salt-water enemata are useful. Belladonna, mercury, nicotine, and electricity have not proved serviceable.

In conducting the treatment of a case diagnosed as intussusception of the small intestines, it must be borne in mind that reduction can be easily made only at an early period, before the adhesions have become firm. It is important, therefore, to lose no time in employing the more simple methods. If these fail to relieve, the surgeon should resort to abdominal section. Laparotomy has these advantages—viz. 1, the intussusception may be relieved by traction; 2, the involved bowel may be resected; 3, the bowel may be opened and attached to the wound, forming an artificial anus. It may be undertaken at the earliest age, having proved successful in the infant of six months; but it is important that it should be performed as early as practicable, for success depends largely upon the condition of the bowel; and when the strangulation is tight, the parts speedily become so altered by swelling, adhesion, and softening that no amount of force short of that liable to cause rupture will suffice to liberate them.¹

Intussusception at the ileo-cæcal valve assumes two principal forms: (1) ileo-colic, the passage of the ileum through the ileo-cæcal valve; (2) ileo-cæcal, the passage of the ileum and cæcum into the colon: the former is very rare, the latter the most common, especially in childhood and during the first year.

These invaginations more often run a chronic course, and are distinguished from those of the small intestines as follows: by the tenesmus, which is rarely present in any marked degree where the small intestine only is implicated; by the greater size and fixation and different site of the sausage-like tumor, which, if large, generally occupies the left side of the hypogastric or left iliac region; by the hemorrhage, which instead of being copious is little more than a scanty admixture, scarcely sufficient to tinge the mucus passed from the bowels with violent and frequent straining; by the degree of obstruction, which seems to be really absent, owing to the patulous state of the axis of invagination; by the presence in the more marked and protracted cases of the invagination in the rectum.²

The tumor is rarely discovered in the region of the cæcum, owing to its small size, want of firmness, and its rapid progress along the colon, rendered easy by the great mobility of the cæcum; nor is it easily detected when it occupies either colic flexure, particularly the right, where it will be overlaid by the liver; more often it is found along the course of the descending colon as an elongated swelling somewhat movable from side to side, frequently becoming harder and more prominent during a paroxysm of pain; the finger in the rectum may detect

¹ H. B. Sands.

² W. Brinton.

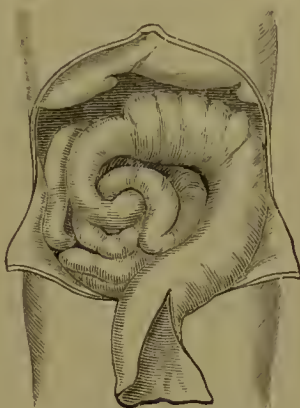
the tumor and define the ileo-cæcal valve, and if the other hand meantime is applied to the abdomen, the continuity of the rectal and abdominal tumor may be determined (Fig. 180).

The post-mortem appearances of fatal ileo-cæcal intussusception were as follows (Fig. 180): The descending colon was enormously enlarged and full; the sigmoid flexure was distended and made a great curve nearly to the right side of the abdomen; the distended transverse colon, thrown into transverse folds, could be traced to the right side of the median line; the ileum, cæcum, and ascending colon were entirely intruded and pushed into the descending colon, descending into the rectum within a few inches of the anus: on opening the rectum and sigmoid flexure the termination of the intussuscepted portion was found to be almost black, the apex very tense, and its opening marked by a fissure caused by a contraction of the mesentery: turning aside the bowel, it was found to be convex and twisted from the dragging of the mesentery, and at the concave side was a large irregular ulcer at the most tense portion; there was general peritonitis, due to perforation of an ulcer in the sigmoid flexure.

The treatment is the same as ileum invagination, to which is added injections of air and water. The distension of the lower bowel must be carried to the fullest extent short of rupture, and should be undertaken early, before adhesions have formed: if water is used, place the child on the lap of the nurse; elevate the hips forty-five degrees, to secure the aid of gravitation; provide lukewarm water, and with the common bulbous syringe—or, better, the fountain syringe—inject it gently until the abdomen is somewhat distended; now carry the finger gently but firmly over the abdominal walls along the direction of the colon, in order to force the liquid upward against the intussusception; if the water is discharged, the injection may be several times repeated. If water fail, inflation may be resorted to, which produces a more equable and effective distension; the common bellows with a tube is efficient; or carbonic acid gas may be employed as obtained from bottles charged with the gas in the shops; by inversion a powerful current may be conducted through the tube of a rubber syringe.

The amount of distending pressure which it is safe to apply to the bowel in employing water is fixed in the infant at eight or nine pounds.¹ The fountain syringe is considered the only one that can be used in these cases with accuracy, and therefore it is the only one that should be employed; by it the amount of force used can be accurately measured, as

FIG. 180.



Intussusception of Cæcum.

¹ W. E. Forest.

every two and a half feet in height of the reservoir above the point of delivery represents about one pound pressure on every square inch of the intestine below the point of obstruction; if the reservoir is suspended seven and a half feet above the child, a force of three pounds to the square inch is exerted on the obstruction; the rubber tube being fifteen feet in length and vertical, the pressure will be six pounds to the square inch; with a tube of sufficient length any pressure can be brought to bear on the tumor as desired. It will be accurate enough for all practical purposes to estimate that a column of water two and a half feet high exerts at its base in every direction a pressure of one pound to the square inch; hence the exact force used in giving an injection can be obtained in this manner. The only important feature about the siphon syringe is the long tube or a number of pieces of rubber tubing that can be spliced. A glass vaginal syringe with a shoulder one inch from the end will be found a very important adjunct: by this simple contrivance an injection may be given without fear of wounding the intestine, without making painful pressure on the parts about the anus, without the escape of a drop of the liquid used, and with the utmost ease and convenience to the operator; its effectiveness is due to the fact that during the terrible expulsive efforts of the patient the stretched sphincter is supported by the large tube and the shoulder, and thus none of the liquid used can escape. The danger of using the common bulb-syringe is seen in the fact that with the hand a force of ninety pounds can be brought to bear upon the column of water.

The operation of laparotomy in this form of invagination should be undertaken as a last resort, but the delay should not be so great as to endanger the integrity of the bowel.

THE RECTUM.

This bowel commences at the left sacro-iliac articulation, and is directed at first obliquely downward and from left to right, to gain the middle line of the sacrum; it then changes its direction and curves forward in front of the lower part of the sacrum and the coccyx; it then turns backward and downward to the anus. At its upper end it is narrower than the sigmoid flexure, but above the anus it is dilated into a large ampulla or reservoir.

The rectum is developed from the internal blastodermic layer. The development begins at the upper part of this bowel, and as it progresses the rectum descends into the pelvis until it reaches a cul-de-sac which has for its external opening the anus. The continuity of the passage from the rectum to the anus is effected by the absorption of the intervening tissue.

The affections of the rectum in infants which require the care of the

surgeon are the result of its imperfect or irregular development. The bowel may descend properly, and yet a very thin partition between it and the anal cul-de-sac may remain unabsorbed; or it may be arrested at any point in its descent; or it may make abnormal openings into the bladder or vagina.

Imperforate rectum exists when there remains a partition between the rectum and the anal cul-de-sac still unabsorbed at the birth of the child. The symptoms are those of retention of the meconium, followed by abdominal distension and vomiting.

On examination with the finger or an elastic catheter or bougie the occluding membrane will be discovered. If the membrane is thin, there will be noticed a bulging of the septum when the child cries, and a decided impulse against the tip of the finger if it is employed in exploration.

If there is no marked distension of the rectum and the symptoms are not pressing, the operation may be delayed for two or three days to allow the lower bowel to become well filled with meconium. If the occluding membrane is very thin, it may be possible to break it down with the finger. If it is too dense for rupture by this method, it must be punctured and then incised. The puncture should be made with a sharp-pointed bistoury, the blade being wrapped with thread to near the point. The finger or a director should be used as a guide, the patient being held in the position for lithotomy. The direction of the puncture must be accurately determined, so that it may not deviate from the normal direction of the calibre of the bowel. The appearance of meconium is evidence of penetration through the septum into the cavity of the rectum. The opening should be enlarged by crucial incisions, and the passage then distended by the end of the finger or by a bougie of suitable size. The subsequent treatment consists in repeatedly distending the strictured part for several months.

Absence of the rectum may be partial—which is more common—or complete, the anus being normal in either case. When it is only partially absent, the other portion usually terminates in a cul-de-sac at a greater or less distance from the surface of the body, or it may be prolonged as a narrow tube or imperforate cord, and blended with adjacent parts. The rectum may be absent, and only be represented by a narrow canal which terminates in some abnormal situation.

The diagnosis of the exact condition of the malformation is impossible. With the finger or with a bougie the presence of the rectum can often be satisfactorily determined, and when present the comparative degree of the thickness of the intervening tissues may be decided. But if the rectum is wholly or partially absent, only a careful dissection can reveal the nature of the changes from the normal which exist.

The operation must be conducted in the manner already described.

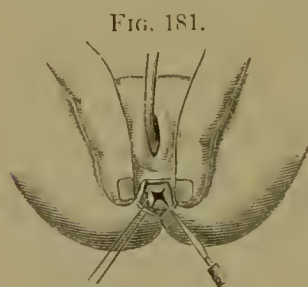
If the rectum is found, it must be brought down if possible, opened, and attached by the margins to the integument. If the rectum is wholly absent, as proved by a careful dissection, the last resort must be a second operation, for establishing an artificial anus.

Vaginal and vesical fistulas, through which the malformed rectum sometimes discharges its contents externally, are complications which must, as far as possible, be relieved.

The vaginal fistula may exist with the rectum perfectly formed and continuous as a separate canal nearly to the anus. Here it may be occluded by tissues more or less thick, and have a fistulous communication with the vagina. Or the rectum may terminate in a cul-de-sac opposite, or even somewhat above, the required opening. The opening into the vagina varies in size and situation, being generally a short distance up the canal, but in some cases it has been near the os uteri.

The purpose of the operation is twofold—viz. first, to secure and maintain the opening of the bowel at the natural site of the anus; and second, to close the unnatural opening into the vagina.

If the rectum continues past the vaginal opening down to or nearly to the site of the natural anus, introduce a curved probe into the vaginal opening, and make it protrude the skin of the perineum at the proper place. An incision should now be made down upon the end of the probe to the intestine, the bowel opened, and the mucous membrane brought down and attached to the external wound, if it can be sufficiently detached from the surrounding tissues.



In case the rectum does not continue down to the perineum, but ends in a cul-de-sac higher up near the vaginal opening, the dissection must be continued upward until the rectum is reached. After opening it an effort should be made to bring the mucous membrane down to the external wound. If this method of securing the continuity of the bowel with the anus is found impracticable, the wound must be kept open by rolls of antiseptic gauze repeated for several days, and by distension with the finger or a bougie for a long period.

On establishing a new outlet through which the feces freely escape, the fistula tends to close. If, however, it remain open, it should be treated as an ordinary fistula by irritating injections, as of iodine, or it may be incised.

A vesical fistula is recognized by the character of the urine. It is thick and of a greenish appearance at the time of the movement of the bowels, and there is often an escape of gases with the urine. The relation of the rectum to the bladder varies much in different cases. In

some the bowel terminates in the bladder directly after its passage out of the false pelvis, and in others it descends nearly to the perineum, and communicates with the bladder by a small fistulous passage. The relief of these cases by operation depends upon the development of the rectum. If it has descended, well formed, nearly to the perineum, the operation already described of cutting down to the bowel and attaching it to the external wound will succeed. But if the rectum terminates high up in the pelvis, and especially if it is imperfectly developed, an operation will probably fail of giving any relief. Fistulous passages to the rectum may be found opening at many other points, but the principles of treatment are the same as those given for vaginal and vesical fistulæ.

Absence of both rectum and anus is rare, but when it exists there is a dense fibrous tissue occupying their normal positions. The absence of the rectum cannot be diagnosed except by an exploratory operation, as with a grooved needle, or by a careful dissection. Before exploring the part there should be a sufficient delay to allow of the accumulation of matters in the rectum. If the needle is used, place the infant on the back with the thighs well flexed on the abdomen. Insert the needle cautiously, bearing in mind the proper position of the rectum along the curve of the sacrum and nearly in its centre. If a dissection is made, the patient should be held in the position given, and the first incision should be made where the anus is located and an inch or more in extent. The dissection should be cautiously made along the curve of the coccyx and sacrum, the finger being used in the wound as a guide. The wound being held well apart by retractors, the exploration should continue a finger's depth if the bowel is not discovered. If it is found, the treatment is the same as that already given.

If it appears on exploration that there is an absence of the rectum, or if the operation through the perineum fail to give relief, there is no other resource but to open the colon and form an artificial anus at the point of operation. Colotomy may be performed in either groin or in the loin, but recent experience proves that left inguinal colotomy should be preferred. The value of this operation in the adult has been demonstrated by Mr. Allingham, who has systematized the details and rendered it simple and comparatively safe in adults. It is better adapted to children than other methods of relieving the distended bowels. The final success of this, as of other operations for the same purpose, is not encouraging. Mr. Edmund Owen¹ has operated six times on infants with immediate relief, but not with permanent success. The operation is as follows:² The abdomen should be cleansed with soap and water, and everything used in and about the wound should be aseptic. An incision is made, about two inches in length, an inch within the an-

¹ *Surg. Dis. Children.*

² Mr. Cripps: *Brit. Med. Journ.*, Oct. 6, 1888.

terior superior spine, and crossing an imaginary line drawn from the anterior superior spine to the umbilicus. In making this incision the skin should be drawn a little inward, so that the opening through the transversalis fascia and the peritoneum is on a different level when the skin is relaxed, thus making the opening valvular and rendering its subsequent closure with a pad easier. The peritoneum being reached, it is pinched up and a small opening made, which is subsequently enlarged to nearly the length of the cutaneous incision. The small intestine generally first presents, but on pushing it back the colon often shows itself: if it does not, it can readily be found by passing the finger downward into the pelvis, and following the rectum upward till the sigmoid flexure is reached; which can be hooked out with the tip of the finger. A loop of bowel being drawn into the wound, two provisional silk ligatures are passed through a portion of the peritoneal coat opposite the mesenteric attachment. These provisional ligatures help to steady the bowel during subsequent stitching to the skin. They should be an inch or more apart. The bowel is now returned to the cavity, and the parietal peritoneum is picked up with forceps and attached to the skin on each side of the incision by two or three sutures of fine silk. The bowel is again drawn out by means of the provisional ligatures, and fixed to the skin by four or five fine sutures. These sutures are passed by fine partly curved needles, passing first through the skin an eighth of an inch from the margin, then through the parietal layer of the peritoneum, and lastly through the peritoneal and muscular coat of the bowel, care being taken to avoid perforation of the mucous membrane. It is better to pass all of the sutures before tying any. A suture should now be passed through the skin and the peritoneal layer of the bowel at each end of the wound. It is desirable to pass the sutures not far from the mesenteric attachment of the bowel, so that about two-thirds of it is external to the wound. The wound is now dressed with antiseptic appliances, the immediate covering of the wound being a piece of green protective to prevent adherence to the part. The dressing should be reapplied on the next day to make sure that nothing has been displaced. On the fifth or sixth day the union will be firm, and the opening of the bowel may be made directly between the two provisional ligatures.

If the distension is very great at the time of the operation, and it may be deemed necessary to open the bowel at once for relief, an assistant must compress the bowel above and below the place of incision to prevent the escape of matters while the edges of the wound are being stitched to the skin.

Polypus of the rectum is occasionally met with, and it may be very soft or of considerable density. It usually creates irritation of the rectum and bladder, causing painful efforts to evacuate the bowels.

These efforts are attended with the passage of blood from the bowels, and sometimes the tumor may appear slightly externally. It usually has a pedicle, which may be gradually lengthened by the pressure of the feces during the straining efforts of the child. The symptoms of vesical calculus may be present, and unless the surgeon is thorough in his examination he may be entirely deceived as to the source of the trouble.

Exploration of the rectum should always be made when defecation in a child is painful, with the passage of blood, and no other cause is apparent. The spasm may be so great on attempting exploration that an anæsthetic must be given.

Removal is the proper remedy. It will sometimes happen that the tumor will be dislodged by the finger during the examination. It will be necessary to dilate the anus generally, pull down the tumor, and ligate the pedicle.

THE ANUS.

The anus is the lower opening or extremity of the alimentary canal. It is surrounded internally by mucous membrane and externally by the skin. These membranes here become continuous and pass into each other. The lower end of the rectum and the margin of the anus are embraced by the internal and external sphincter muscles, and supported by the levatores ani. The anus is therefore a dilatable orifice.

In all operations upon the anus its peculiar function as the outlet of the intestine, with power of voluntary closure through the action of the muscles mentioned, should be borne in mind. Impairment of these muscles by operative procedures can often be avoided if the surgeon exercises good judgment and proper care, when, otherwise, their functions might be destroyed, and a lifelong disability of a most distressing character entailed.

The affections of the anus in infants requiring surgical care and treatment are congenital defects.

An important duty of an accoucheur, too often neglected, is to examine the newborn as to any defects about the anus. If closure of the anal aperture is not discovered until the nurse has given the child a laxative, as occasionally happens, great suffering may attend the useless efforts at evacuation. When closure exists the infant may be allowed to nurse moderately until relieved by an operation, for, although vomiting may be a marked feature in the act of digestion, yet sufficient nourishment may be received to maintain the strength of the child for a considerable period. But when the defect is made out an early operation for its relief is necessary.

Contraction of the anus is the simplest congenital defect. The anus

may alone be involved or the narrowing may extend also into the rectum. The form and situation of the anus are generally normal, but the orifice is puckered or plicated: the narrowing may be slight or it may only admit a probe. The symptoms are retention of meconium, vomiting, and progressive painful tension of the abdomen. The treatment is dilatation carefully conducted to overcome the induration of the integument about the anus. If the narrowing is not great, the dilatation should be begun with a graduated bougie and completed with the finger. The tip of the bougie should be of a size to readily pass the strictured part. If there are feces in the rectum, move the bowels with an enema. If no enema is required, a little oil should be injected to lubricate the passage. The best position for the patient is on the back, with the thighs well flexed. The bougie should first be dipped in hot water, to render it soft and pliable, and should then be well oiled. It should be passed gently but firmly into the constriction, the direction of the rectum with reference to the opening of the anus being duly regarded. The operation should be repeated daily until the normal calibre at least has been secured. When the dilatation has reached a point which makes it possible to substitute the little finger for the bougie, it is better to use the finger.

If the narrowing is extreme and the parts are very rigid and unyielding, the constriction must be relieved in part by incision. The knife, however, should not be employed unless efforts at dilatation fail, as incisions are liable to be followed by firm contractions, unless great pains are taken to keep the passage well dilated. The first incisions should be on either side in the direction of the tuber ischii. The depth and extent of these incisions must depend upon the relief afforded. They should be of such depth that feces are evacuated, but the sphincter should be incised as slightly as possible. If the first incisions prove too slight, they should be cautiously repeated. The bougie should at once follow making the incisions, but the pressure should at first be moderate. The bougie or finger should be disinfected with carbolized oil before using it when incisions have been made.

The anus may be slightly occluded by an extension of the integument partially over the orifice. When this membrane exists it should be freely incised and broken up by the bougie or finger.

Imperforate anus exists when the anal aperture is completely covered by a membrane. This tissue may be very thin, so that the meconium may be seen distending it, or it may be so thick and unyielding as to resemble very closely the skin. The diagnosis is readily made. If the membrane is thin, it appears as a small bluish mass in the situation of the anus, which is enlarged by distension with the meconium when the child cries. If the membrane is thick, there will still be the tumor, which will become tense when the child cries. With the finger the

anal space may be readily detected, and on pressure the tumor will recede, but will again immediately become prominent on withdrawing the finger.

In the treatment it is to be borne in mind that the structures forming the anus and rectum are normal, and that the treatment should aim only to remove the obstruction offered by the membrane. The operation consists of a puncture of the centre of the membrane, and from this point the making of a crucial incision, one portion running antero-posteriorly, and the other laterally. The puncture should be made at the dark point in the membrane which indicates the centre of the anus. The incisions should be made with a probe-pointed bistoury. The immediate effect of the operation is the discharge of the accumulated meconium and relief of the most distressing symptoms. If the membrane is very thin, the flaps formed by the crucial incision may be left to disappear by absorption, or they may be removed by scissors. If the membrane is thick, the flaps or angles should be excised. The first dressing should consist of the introduction of a pledget of absorbent cotton covered with carbolized oil and held in place by a bandage. This dressing should be removed whenever the bowels move for several days. On the removal of the dressings the anus may be usefully dilated with the finger well oiled.

Absence of the anus is characterized by the obliteration of every

FIG. 182.



Imperforate Anus.

trace of the orifice (Fig. 182). The perineal raphé extends from the scrotum to the point of the coccyx without interruption, and the space of the anus is occupied with cellulo-fibrous tissue. But behind this membrane is the rectum, fully formed and filled with meconium. The defect is not in the development of the rectum, but of the anus.

If the rectum is near the perineum, fluctuation may sometimes be detected by the finger in the perineum or by pushing up in the direction of the rectum while with the left hand firm pressure is made upon the anterior walls of the abdomen inward and downward toward the finger in the perineum. If the rectum is near the external surface the finger will detect its presence.

It has been stated by Mr. A. C. Hutchinson that gentle titillation of the skin with the finger over the natural situation of the anus will cause the child to strain to evacuate the bowels, and thus produce a protrusion of the distended rectum, provided it is low in the pelvis.

The prognosis in these cases is very favorable. If the rectum descends nearly to the perineum, the case is one which admits of relief with much certainty.

Before proceeding with the operation the surgeon should determine, as nearly as possible, the exact site of the anus. In general, the sphincter muscles exist in a more or less complete state, and it is desirable to preserve their functions about the new-formed anus. To effect this purpose the location of the anus should be fixed, and the operation should be conducted with a view to restoring its functions. In some cases it will be found useful to introduce a small sound through the urethra to the bladder to determine its position and its relations to the rectum. If it deviate in such manner as to indicate malposition of the organs of the pelvis, the sound should be used during the operation.

The details of the operation are largely those of exploration, and care should be taken to employ all necessary antiseptic measures. The best position of the child is that for lithotomy. It may be placed on a table, but ordinarily an assistant or a competent nurse can secure the infant on the lap so as to give good light and prevent motion. The thumb and finger of the left hand should be placed on either side of the perineum, and the central portion put on the stretch. The first incision should be exactly in the median line from a point near the scrotum to the extremity of the coccyx (Fig. 183). The incision should

FIG. 183.



Incision for Imperforate Anus.

be repeated, but the length limited, the deepest portion of the wound being at the point where the anus is believed to be located. This part of the wound should be frequently examined with the point of the finger to ascertain by fluctuation the presence of the blind sac of the rectum, and also the position of the bladder or vagina. If the dissection is made strictly in the median line there will be no danger of hemorrhage from wounds of

large vessels, but any considerable deviation laterally is dangerous.

If the rectum is not found in the middle line, search should be made posteriorly, as the extremity is sometimes displaced from the centre.

The bowel will be recognized by its dark-brown color, its elasticity, and its evident fluctuation. It is important to avoid opening the bowel if it is found to be near the anal opening. In order to preserve the cleanliness of the wound, the proper course is to detach the rectum and draw the portion presenting down with forceps until it lies in the external wound. The finger is generally most useful in separating the bowel, but the scissors or knife may be required. When the bowel is well exposed, it should be opened and the contents thoroughly evacuated. The exposed portion should now be thoroughly cleansed, and the margins of the wound of the bowel should be accurately united to the integument by six sutures (Fig. 184). The end of the rectum should occupy the exact situation, so far as it can be determined, of the undeveloped anus. The mucous membrane should not be included in the suture, but should be allowed to overlap the integument, to prevent the wound being soiled by the discharges. The remaining portions of the wound, anteriorly and posteriorly, should be closed and antiseptic dressings applied.



Band attached to External Wound.

The child should have its legs bound so as to prevent strain of the wound. The wound must be carefully watched to prevent soiling, and the dressings should be such that they may be readily renewed.

It may be found impossible to loosen the attachments of the bowel so as to bring it down to the margin of the external wound. In that case the bowel must be opened in its first position by a longitudinal incision, and there be allowed to remain. In the final perfection of this wound care must be taken to maintain the opening free by passing graduated bougies.

Abnormal anus is characterized by the existence of fistulous openings through which fecal matters are discharged at unusual points, the normal anus being occluded or rudimentary or absent. The rectum may terminate in one or several sinuses, which open in the perineum, or beneath the urethra, or at the vulva, or in the sacral region.

If the canal or canals are direct and of considerable size, the infant thrives for a time, owing to the ready escape of the semifluid contents of the rectum. But when the feces become more consistent the escape is difficult, and relief by operation is imperative.

The indications are to establish an anal opening at the proper point and separate the fistulous passages from the rectum. If the anus is merely occluded by a membrane, this should be divided, as already described, and the passage of fecal matter from the rectum made direct. The fistula should be closed by incising it or by passing through it a silk ligature by which its walls are destroyed, or a rubber band may be passed and by frequent tightening made to cut its way out.

If there are two fistulae near together at the anus, it will merely be necessary to divide the septum and thus establish a free outlet.

When there is no trace of an anus the operation performed must resemble the one already described for that malformation. The fistulous passages may be useful guides to the rectum. The dissection should be cautiously made in the direction of the normal course of the rectum. When the bowel is reached, it should, if possible, be brought down to the external wound and sutured, while the sinuous passages should be divided and treated with a view to their closure.

HYDROCEPHALUS.

Congenital hydrocephalus is an effusion into the ventricles of the brain. The bones of the cranium being ununited, they readily yield to the pressure within, and the increasing fluid gradually unfolds the convolutions. While the base undergoes but little if any change, the frontal, parietal, and occipital bones are expanded and become much thinner. The hemispheres are spread out in thin laminæ on either side, decreasing in thickness from the base to the vertex. The membranes do not undergo any change except what is due to distension. The effusion is caused by a chronic inflammation of the lining membrane of the ventricles and of the arachnoid. The prognosis is always very unfavorable.

The cure of the affection depends upon the subsidence of the inflammation. As this cannot be treated directly, only temporizing measures can be pursued. Two methods of treatment have been adopted to overcome the accumulation of fluid—viz. compression and tapping. Compression should be employed as follows: Cut strips of adhesive or rubber plaster one-third of an inch in width; apply first a strip from each mastoid process to the outer part of the orbit of the opposite side; then from the back of the neck apply a strip along the longitudinal sinus to the root of the nose. These strips are to be applied over the whole head, so arranged that they cross at the vertex. The dressing is completed by passing a long strip around the head three times just above the ears and eyebrows and below the occipital protuberance. The dressing should not be too tight, lest convulsions should be excited. If the health of the child continues good and the compression is well tolerated, the cap must be continued. If, however, there is an increase of the fluid and convulsions seem to threaten, the straps must be loosened or removed altogether.

If tapping is indicated, select a small aspirating-needle, or a small trocar if the aspirator is not used. Thoroughly cleanse and disinfect the part of the scalp where the puncture is to be made. Then, holding the needle or trocar perpendicularly, insert it at the edge of the

anterior fontanelle, to avoid the longitudinal sinns and the large veins emptying into it. The fluid should be withdrawn very slowly, and moderate external compression should be carefully maintained by the hands of an assistant or by a bandage. Not more than two or three ounces should be withdrawn at one sitting. If during the operation the pulse becomes weak or the dilated pupils contract or there are signs of convulsions, the needle or canula must be withdrawn and the puncture closed with adhesive plaster, previously treated with disinfected water.

The tapping should be repeated, if the symptoms are favorable, in three or four days.

Meningocele consists of a protrusion of the meninges of the brain by an accumulation of fluid within the cranium of the newborn infant.

The tumor appears at one of the foetal openings of the bones, and is caused by a pre-existing hydrocephalus. The ordinary situation is in the occipital region (Fig. 185) where the tumor protrudes through the expanded portion of the occipital bone, behind the foramen magnum, and in the median line. The tumor may appear at other points, especially at either

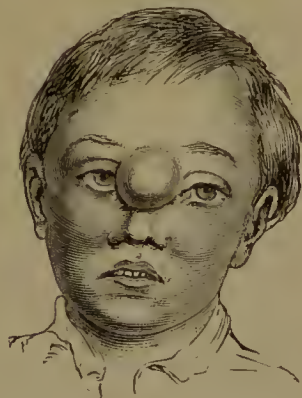
FIG. 185.



Meningocele.

fontanelle and at the root of the nose (Fig. 186). It may appear at the sides of the skull, where the bones are joined, at the inner angle of the orbit, above the orbital arch, in the temporal region, at the base of the skull, communicating with the deep parts of the face. The tumor may be a single sac or it may have numerous septa; it may be sessile or may have a pedicle; it may be translucent like a hydrocele and enlarge when the child cries, or it may be reducible. The nature of the tumor may be recognized by these appearances and by its being congenital.

FIG. 186.



Meningocele at the Root of Nose.

In treatment the danger lies in the relations of the meninges and brain to the tumor. Care must therefore be taken from the first to avoid exciting inflammation of these tissues. Irritating external applications are not only useless to effect a cure, but may prove very harmful. On the contrary, the tumor should be supported and protected in such manner as

to make gentle pressure. A bandage may be used or a cap protected with cotton-wool to prevent ulceration, as gutta-percha lined with

layers of wadding which can be increased in thickness as the tumor yields to pressure. If the tumor increases in size without other symptoms, puncture may be resorted to. Care must be taken to cleanse the surface of the tumor with soap and water and disinfectants, and the needles must first be placed in carbolized water. The dressings after the puncture must be aseptic.

If the tumor has a pedicle, so as to separate it in some degree from the cranial cavity, injections of iodine—5ij, with equal parts of water—may be employed, some of the fluid having first been removed. Noble¹ reports a case cured by the injection of a preparation of ten grains of iodine and thirty of iodide of potassium in an ounce of glycerin. Of this fluid eight-minim doses were injected into the wall of the sac, not into the cavity, for the purpose of affecting the lining membrane. The injection was frequently repeated until the cure was complete.

Excision is the radical method of treatment. It may be performed without hesitation when the communication between the contents of the tumor and the brain has been obliterated. If there is an opening into the cranial cavity, the operation may still be successfully performed, but the most rigid care must be taken that antiseptic measures be thoroughly employed. If there is no opening, the excision is performed as for any simple tumor. If an opening exists, bichloride solution should be used during operation. A clamp may first be applied to the pedicle. Flaps should be made of the skin of sufficient size to cover the wound without tension. In closing the wound the deeper structures may first be united by catgut sutures, and then the skin flaps should be brought together accurately. A catgut drain should be inserted at the lower angle of the wound. Bichloride gauze should be applied and maintained by a bandage.

Encephalocele resembles a meningocele, but its contents consist of a protruding portion of brain or of brain and dropsical membranes. It appears at the various openings of the skull, and may be sessile or pedunculated. It is recognized as a congenital tumor after pulsating, and is generally small and flat. It is most difficult of diagnosis when seated at the root of the nose, in the course of the frontal suture, or near one of the angles of the orbit, as it resembles sebaceous or other tumors. In cases of doubt the effects of pressure must be noted, and the examination should be several times repeated. As a final method of determining its nature, a disinfected exploring-needle may be employed. The principle of treatment is the same as that of meningocele, but radical measures, as excision, must be very cautiously undertaken and with all necessary antiseptic precautions. These tumors are closely allied, and differ essentially only as to their contents. Meningocele is

¹ *Lancet*, 1884.

a tumor covered with the membranes of the brain, and containing fluid, while in an encephalocele the contents consist of brain-substance. They occur as protrusions of the contents of the cranial cavity, and may exist at birth (congenital) or may appear soon after birth (acquired). The brain escapes at an aperture of the skull or at a perforation of the bone. The tumor may appear in the occipital or frontal region, and is more frequently in the median line. When it occurs posteriorly the brain escapes through an opening near the middle line of the occipital bone. In anterior encephalocele (*procencephalocele*) the tumor appears at the root of the nose, more often at the junction of the frontal and nasal bones. Enephalocele may occur through a division of the cervical vertebræ.

Protrusion of the brain may be met with in the temporal and in the parietal regions, or the tumor may enter the orbit through the sphenoidal fissure and force the eyeball forward, or it may appear in the mouth through the sphenomaxillary fossa.

The tumor is double in some instances, but more often when it is situated at the internal angle of the eye.

The appearance is that of rounded tumors, semi-transparent, generally slightly fluctuating; the skin is natural, and if there is pulsation it is synchronous with that of the heart. When located, dissection shows that the coverings of the tumor consists of skin, fascia, cellular tissue, and the aponeurosis, and the contents of dura mater, arachnoid, and the brain-tissue. The arachnoid usually supplies the fluid, which sometimes contains spermatozooids.

Cephalhydrocele.—This affection is a subfascial accumulation of the cerebro-spinal fluid, due to a simple fracture of the vault. Prof. O'Conner¹ of Cincinnati reports two cases which occurred in his own practice, and refers to twenty additional cases of this comparatively rare accident. It is a very serious disease, owing to the liability of the patient to meningo-encephalitis and abscess. Even in those who recover there has been a subsequent morbid mental condition, indicated by irritability of temper.

The diagnosis of the nature of the affection must rest upon an examination of the fluid of the tumor. Pulsation was absent in about half of the cases. When there is evident pulsation synchronous with the heart-beat, and a normal-colored but thin scalp-covering, so that translucency is observable; when increased fulness is apparent on crying or holding the breath; when upon pressure a diminution of volume is readily effected, with or without resulting symptoms of cerebral irritation,—the diagnosis is clear, and should be made at once. But under opposite conditions, where there is no pulsation, no translucency, no recognition of a cranial gap,—nothing but the withdrawal

¹ *Transact. Am. Surg. Asso.*, vol. ii.

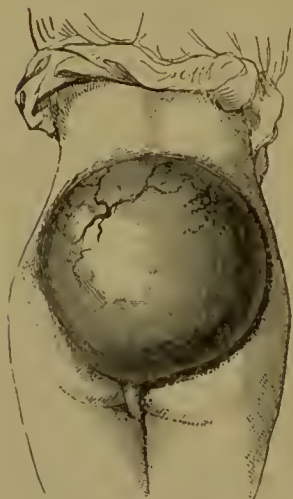
of a fluid in appearance and chemical constitution similar to the cerebro-spinal fluid will determine the existence of a traumatic cephal-hydrocele.

The treatment employed has availed little toward effecting a cure by closure of the fracture. Removal of the fluid by aspiration is only palliative.

SPINA BIFIDA.

Spina bifida (Fig. 187) is a defect in the bones of the spinal column which admits the protrusion of the membrane in the form of a hernia;

FIG. 187.



Large Spina Bifida.

it is of the same nature as a meningocele, and contains subarachnoid fluid, and often nerve-trunks, and even the spinal cord itself; hydrocephalus often exists at the same time. The defect may exist at any point in the column, cervical, dorsal, lumbar, or sacral, but the lumbo-sacral form is most frequent; the tumor may have a broad or very narrow base, and directly open into the spinal canal or be quite disconnected; its covering may be quite thick, or so thin as to be transparent, or ulcerated so as to allow the escape of its contents; it is usually quite tense when the child is awake and erect. In general, this affection proves fatal, sometimes owing to the defective organization of the child, in other cases from convulsions or an inflammation following an open-

ing of the sac. No case of spina bifida ought ever to be subjected to any active operative interference, except in the most urgent circumstances, and the mildest measure which affords any rational prospect of cure should be the one selected. It may be treated by punctures with needles and compression, the punctures being at the side to avoid nervous tissue, or it may be repeatedly punctured, the fluid withdrawn, followed by strong compression. Injections of iodine may be used, as follows: Draw off several ounces, then inject five grains of iodine and fifteen grains of iodide of potassium dissolved in an ounce of water; after a few seconds allow this fluid to flow out, wash the sac with water, and inject two ounces of the original cerebro-spinal fluid. Pressure around the neck of the sac may be made to bring the internal surfaces in contact and secure adhesions, and thus shut off the cavity of the tumor from the spinal canal and admit of its excision. Excision has been successful when there was no nervous tissue in the sac and the pedicle was small, after applying a clamp several days and thus

exciting new action in the sac. If the base is broad, dissect the soft parts from the sac, opening it by free incision on one side, removing a portion, but reserving a flap to be attached to the root of the pedicle on the other side of the opening into the spinal canal. Evacuation of the contents of the sac, pushing its collapsed parietes back into the canal, and uniting the soft parts over all sufficiently tight to prevent protrusion, may be attempted; these operations must be antiseptic.

Growths form about the sacrum and coccyx which are usually cystic in their character. They have been mistaken for spina bifida. When located about the coccyx they may grow to large size and become extremely inconvenient (Fig. 188). They should be cautiously removed with antiseptic precautions.

FIG. 188.



Congenital Coccygeal Tumor.

THE NOSE.

Imperforate nose may be congenital: it is then caused by a membrane stretched across the nostril or by firm fibrous tissue or by simple continuity of the integument. In congenital closure the interference with respiration and sucking often requires an early operation. In most cases a simple incision carefully made through the obstructing membrane, and the opening maintained by strips of lint or a short elastic canula, is sufficient. Sometimes it may be desirable to excise a portion of the obstructing tissue. When there is no indication of the opening of the nostril, the adherent parts must be gradually and cautiously divided until the nasal canal is restored.

Occlusion occurs at different points. Closure of the nostrils may be by membrane or by fibrous tissue, or result from catarrhal inflammation, or one ala or both may be adherent to the septum or even to the upper lip. As these defects interfere with respiration and prevent the infant from sucking freely, they demand early operation. Make a simple incision of sufficient extent carefully through the membrane, or excise a portion and keep it open by lint or canula until the cut surfaces are healed.

Narrowing or stenosis of the deeper passages may be sufficiently overcome in infants by the use of hollow bougies as dilators, or in more severe cases by forcible distension by means of a pair of thin, long-armed forceps, by the opening of which the abnormally approximated bones are separated. Bony closure of the posterior nares may exist from a continuation of the free posterior border of the palate-bones upward and backward. This occlusion may be overcome by perforation of the bony plate.

GROWTHS IN THE LARYNX.

The most frequent growths in the larynx in children are papillomatous in character. They appear as wart-like projections, and give rise to symptoms of laryngeal irritation, and, finally, of obstruction. It is difficult to bring them into view by inspection, owing to the struggles of the child.

Dr. H. S. Johnson of Chicago reported several cases of congenital papillomatous tumors of the larynx to the American Laryngological Association.¹ In one instance the tumor was expelled by coughing. The symptoms were cough, obstructed respiration in paroxysms, spasms, and finally complete arrest of breathing. The treatment of these growths in a child must be removal by thyrotomy or relief by tracheotomy.

THE URINARY BLADDER.

Extroversion of the bladder is a congenital malformation, occurring chiefly in males, in which the anterior portion and the parietes of the abdomen are absent, so that the posterior and lower part of the bladder protrudes, under the pressure of the viscera from behind, as a round red tumor covered by mucous membrane, in which the orifice of the ureters can be seen.

The linea alba bifurcates at the upper angle, but is continued on either side of the ossa pubis, forming a triangle; the pubic bones are not united by a symphysis; the penis is small; the ureter and corpus spongiosum are deficient in their whole extent; and the only remnant of the urethra is a groove lined by mucous membrane on the dorsum of the penis; the glans penis is full and large, and the prepuce is usually of full size, but cleft above. In the female there is no urethra nor clitoris, but the mucous surface of the bladder is continued directly down into the vagina.

This deformity leads to painful and distressing results, owing to the constant flow of urine over the groin and thighs, but it is in no respect dangerous to life. The treatment may be palliative, by the application of an apparatus to collect the urine, of which there are many kinds. But even the best fitting does not always obviate the gradual soaking by the urine of the skin of the abdomen, groins, and perineum, and hence operations have been devised to relieve the disgusting deformity. Efforts have been made (1) to open communication between the ureters and the rectum,² but the operation is very dangerous and has not given satisfactory results³ (2), to cover the exposed surface; some of these operations have been very successful, and have become legitimate by the approval of good authority.

¹ *Med. News*, May, 1883.

² J. Simon.

³ F. Jourdan.

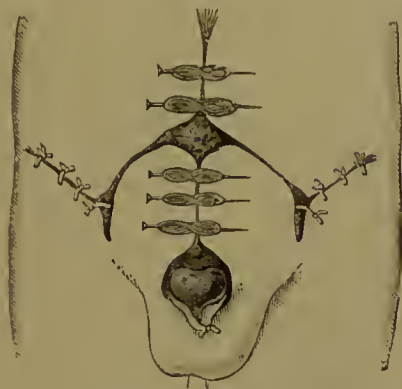
The most successful operations are as follows: Make an umbilical flap, 1 (Fig. 189),¹ and turn it down over the bladder; then make two

FIG. 189.



Wood's Operation for Extroverted Bladder:
outline of incisions.

FIG. 190.



Wood's Operation: flaps applied.

flaps from the groin, one on either side (Fig. 189), and slide them over the central flap, and attach them in the median line (Fig. 190):² the

FIG. 191.



FIG. 192.



Bigelow's Operation.

result is, the skin surface of the middle flap presents to the bladder, and the raw surface is covered by the raw surface of the lateral flaps; the new wound is left to cicatrize. Or dissect off the mucous membrane of the exposed bladder; make lateral flaps from both inguinal regions (Figs. 191, 192); unite them upon the median line and transversely above it; the points A, A, A and B, B being brought together, as the skin more readily yields in a direction obliquely upward; the result is perfect (Fig. 192).

¹ Richards; D. Ayres; J. Wood.

² J. Wood.

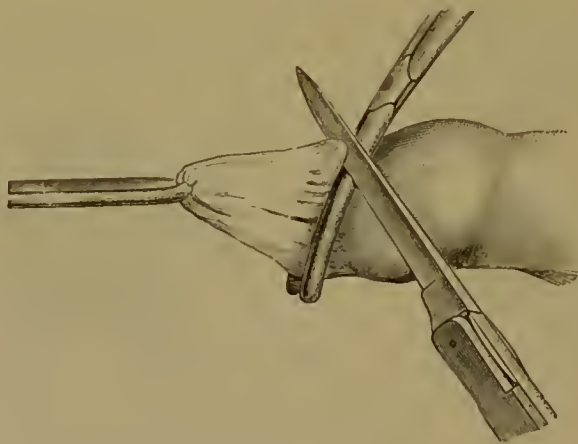
PHIMOSIS.

Phimosis is such a contraction of the prepuce that the glans cannot be uncovered. In the normal condition of the infant the prepuce is adherent to the glans, but later these adhesions are broken down and the prepuce becomes free. If, however, there is inflammation excited by irritants, as accumulations of filth under the prepuce, these adhesions may become firm, or the orifice may become inflamed and so dense that it will not yield, even to allow the free passage of urine. The affection may be a source of great discomfort in children, resulting in spasms of the muscles of different parts of the body, and in adults of collections of filth and foul matters. In performing this operation it is important to seize the orifice of the prepuce for the purpose of making suitable traction on the mucous membrane, which is but slightly elastic compared with the skin. First insert a well-oiled probe under the prepuce, and sweep the surface of the glans to break up adhesions; seize the prepuce with sharp-toothed forceps, and draw it forward until it is put well upon the stretch (Fig. 194); grasp the prepuce firmly just in front of

FIG. 193.

Irritated Congenital
Phimosis.

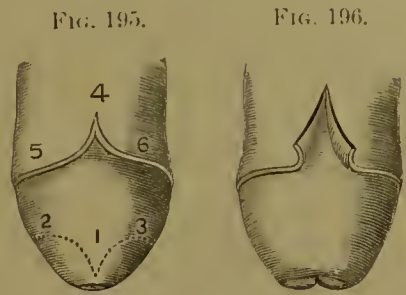
FIG. 194.



Circumcision.

the glans with forceps, and with the bistoury cut away the portion anterior to the clamp; the prepuce readily retracts; now with blunt scissors slit up the mucous membrane on the dorsum, trim its edges, and unite the mucous and skin flaps by a number of fine sutures; if the prepuce is not free, all tightness must be relieved in infants by tearing the tissues; the cut mucous membrane must be attached to the skin by numerous fine sutures beginning at the raphe; rest and water-dressings

only are required in the after-treatment. In slight cases it may be sufficient to slit up the prepuce on the dorsum and attach the edges as before. If there is a contracted prepuce after the excision, slit up the skin three to six lines on the dorsum of the penis (Fig. 195), trim the corners round, 5, 4, 6 (Fig. 196), incise the mucous membrane, 2, 1, 3 (Fig. 196), adjust the point 1 to 4, 2 to 5, and 3 to 6, with sutures, and the rest of the circumference by a sufficient number to hold them in position.



Preparation of the Flaps.

HERNIA.

Direct inguinal hernia forms slowly, appearing first as a prominence behind the external ring, and having a more globular shape than the oblique; the finger enters the abdominal cavity more readily, and on the outer side of the orifice of the sac the internal epigastric artery is felt pulsating very distinctly; it traverses only that small portion of the inguinal canal which lies immediately behind the external ring, and pushes before it or lacerates the conjoint tendon in its passage and the pubic portion of the internal abdominal or transversalis fascia; it is enclosed between the epigastric artery, edge of the rectus, and Poupart's ligament.

Several forms of inguinal hernia are recognized, which depend chiefly upon the varying relations of the peritoneum. They have been explained as follows:¹

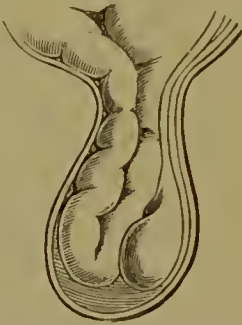
(a) In congenital inguinal hernia the process of peritoneum which passes down with the cord, funicular process, remains freely open; the general cavity of the peritoneum is therefore identical with that of the tunica vaginalis testis forming the hernial sac, the bowel contained in which is in direct contact with the testicle (Fig. 197).

(b) The condition of the parts in an infantile hernia are as follows: The tunica vaginalis, 1 (Fig. 198), is closed above, at or near the external inguinal ring, but its funicular portion is open; the bowel in the hernial sac lies behind this funicular portion, and is represented in the diagram as having made its way between the funicular process and the cord; the relation of the sac to the cord seems, however, to be variable; the bowel is covered in cutting down from the skin by three layers of peritoneum—viz. 1 and 2, the opposite surfaces of the funicular process, and 3, the anterior layer of the peritoneal hernial sac.

¹ T. Holmes.

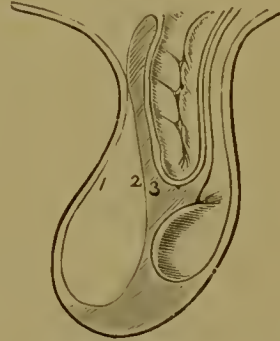
(c) In the encysted form (Fig. 199) of infantile hernia the bowel, instead of passing behind the closed funicular process, has distended the membrane which closes its upper end, and has pushed itself into the funicular process, the upper or back wall of which envelops it; in this case, therefore, the hernial sac is furnished by the funicular process itself, and only two layers of peritoneum cover the intestine.

FIG. 197.



Congenital Inguinal Hernia.

FIG. 198.



Infantile Hernia.

(d) In the common scrotal hernia (Fig. 200) the tunica vaginalis is seen behind and below, and is represented as distended with a certain amount of hydrocele fluid, but quite distinct from the hernial sac.

FIG. 199.



Encysted Form of Infantile Hernia.

FIG. 200.



Common Scrotal Hernia.

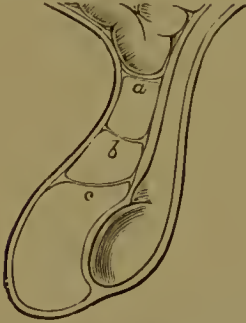
(e) Partial obliteration of the funicular process illustrates the formation of cysts in the cord, encysted hydrocele of the cord (Fig. 201); the cavity of the tunica vaginalis testis is closed at *c*; the funicular process is also separated from the peritoneal cavity at *a*, the situation of the abdominal ring; there is also another septum at *b*. When one or more of these septa are absent or imperfect various conditions occur.

(f) In the formation of the hernia into the funicular process of the peritoneum (Fig. 202) the septum or obliteration at *c* is absent, so that the tunica vaginalis is open as high as the septum, *b*, which is imperfect

or has given way from some accidental cause ; in the diagram the septum at the external abdominal ring, *a*, is drawn as being widely open, but strangulation may occur either in the septum at *b*, somewhat lower down, or at both.

The symptoms and appearances of inguinal hernia are generally sufficiently characteristic, but even in the most marked case it is import-

FIG. 201.



Cysts of the Cord : encysted hydrocele.

FIG. 202.



Hernia into the Funicular Process.

ant, by a formal inquiry and the recognized tests, to distinguish it from different affections which occur in these organs and tissues.

The truss is the first appliance to be resorted to in reducible hernia : it should be applied immediately that the disposition to the formation of the rupture is detected, with a view to procure adhesions of the serous surfaces ; the rule applies to both sexes and all ages, the only exception being a misplaced testis.¹ The effect of such pressure is to approximate the sides of the mouth of the sac, prevent the descent of the bowel, and lead to contraction and final obliteration of the hernial sac. As the commencement of a radical cure by truss-pressure dates from the last time the bowel or omentum came into the sac, it is of the first importance to prevent the hernia from ever coming down. About 15 to 20 per cent. may be cured by judicious and persistent truss-pressure.

In selecting a truss the following principles should be borne in mind :² The practice of rendering easier the adaptation of the truss and aiding the pad to keep its place by making it so conical as to press into the hernial opening like a cork into the neck of a bottle, should be carefully avoided : such a plug from without, acting upon yielding and distensible structures, is unscientific, and, instead of counteracting the dilating influence of the viscera within, is calculated to increase ultimately instead of diminishing the size of the rupture. The constant boring movement produced by the motion of the side-spring has invariably this effect when kept up long, as is demonstrated by the deep, pit-like depression left in the integument when the truss is removed.

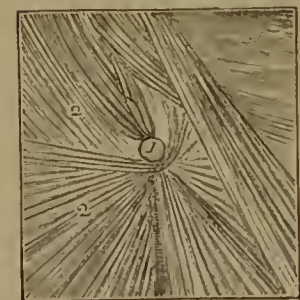
¹ J. Birkett.

² J. Wood.

The investing structures are pushed into the hernial apertures, and produce the same dilating effect from without as the protruding viscera do from within. The truss-pad should have its surface as nearly flat as its adaptation to the body will permit—should be shaped according to the form and outline of the rupture, should be as large as can be conveniently worn, should press upon the wall and sides of the hernial canal quite as much as upon its centre, should be so inclined as to face a little in the direction of the hernial canal, and in corpulent patients should be so inclined as to lie flat upon the sloping integuments. Violent and extraordinary efforts in coughing or straining cannot be effectually resisted by any amount of truss-pressure which can be continuously borne by the patient; hence the truss-spring should be helped under such circumstances by pressure with the hand upon the pad. No contrivance which has hitherto been employed to substitute the steel side or hip-spring is effective in giving real support to the rupture in cases of inguinal or crural hernia; straps and belts are yielding and incapable of such a degree of latent resistance, when passed in a circle round the body, as to be effective at the point required.

Umbilical hernia occurs at the point where the umbilical vessels pass through the abdominal wall; it exists anterior to the period when cicatrization is complete, which varies in different infants, but in general requires several months.¹ When the parts which fill the aperture are firmly cicatrized this point of the wall is firmer than the surrounding parts,² owing to the condensation of the cicatrix and the peculiar arrangement of the fibres of the transversalis fascia³ (Fig. 203).

In infants the protruding viscus pushes before it that portion of the parietal peritoneum lying immediately behind the aperture in the linea alba, through which the umbilical vessels enter the abdominal cavity; the hernial sac thus formed before the closure of the ring is effected may pass into the connective tissue of the cord itself before that structure has separated; after the separation of the cord the hernial sac may be protruded in consequence of the umbilical aperture remaining imperfectly closed when it is covered only by the integuments; in the youth the hernia may escape through a partially closed ring, which it dilates by continual pressure; in the adult



Fascia at Umbilicus.

the fibres of the linea alba may become separated by stretching, owing to the pressure within, and the hernia escape at the site of the once closed ring or in its vicinity (Fig. 203).

The hernia begins by forming a soft, projecting, ovoid tumor at the

¹ W. Lawrence.

² A. Scarpa.

³ Frobieps.

navel; at first it may be reduced by pressure, when a small hole is felt with very sharp and rigid edges; if the finger is removed, the skin either remains relaxed in the fossa of the navel or it is slowly projected forward; as the disease progresses the protruding viscus descends lower and lower, so that the broadest part lies below the mouth of the sac; the tumor varies much in form, the transverse diameter being sometimes greater than the vertical; occasionally it is pyriform, and seems suspended or spread out like a mushroom (Fig. 204); again, its base is nearly as large as its body; in infants the hernia usually contains

FIG. 204.

Congenital Umbilical Hernia.¹

intestines, but in the adult omentum is generally added, and sometimes the stomach; the coverings, usually very thin and often inseparably united, are the integument, some fat, the internal abdominal fascia, the sac; the body of the sac is usually very delicate, but stronger near and at its orifice, around which the tissues form a firm, resisting, unyielding band; the mouth of the sac is often large in proportion to the bulk of the protrusion.

Umbilical hernia, if congenital, should at first be treated with a piece of lint wrapped around a penny-piece and kept on with a light flannel bandage, lightly swathing the infant's body and kept from chafing by powdered starch.

This form of hernia seen in the infant requires persistent efforts to close the opening by the following dressing: Apply a flat pad of any soft and tolerably firm material, moulded to the shape of the parietes and extending beyond the margin of the opening (Fig. 205); maintain it in position by adhesive strips or by a broad elastic band properly padded; remove the apparatus frequently to preserve cleanliness and prevent chafing, the finger being applied meantime to the opening. Radical cures have been effected by the truss.

FIG. 205.



Umbilical Truss.

¹ T. Bryant.

DISLOCATIONS.

Dislocations are rare in infancy. The symptoms and treatment are not peculiar to this class of patients. The cause is almost invariably some injury during birth. There may be no other injury than rupture of the capsule, simple dislocation, or there may be a wound of the integument entering the joint, compound dislocation. The signs of dislocation are preternatural immobility, and tendency, when reduced, to remain, but with free motion without crepitus. The treatment required is immediate reduction; anaesthetics must be used for relaxation; when reduction is possible by manipulation this method should always be preferred; if more force is necessary, make extension and counter-extension with the hands, aided with bandages tied in the form of the clove-hitch; if more power is required, resort to mechanical contrivances, as the pulley. Compound dislocations are among the most serious accidents which can befall a limb, but it must be borne in mind that by the proper use of antiseptic dressings these injuries may now be treated without suppuration, and are therefore far more amenable to conservative measures than formerly. The treatment must depend upon the amount of injury in each case; if slight, reduction may be effected by suitable enlargement of the wound, followed by thorough cleansing and disinfection; resection should be made when the bones are destroyed, the antiseptic dressings being employed; amputation will be necessary when the principal artery of the limb is ruptured or there is great destruction of the tissues about the joint.

FRACTURES.

Fractures discovered at birth may have occurred *in utero* or during parturition. Intra-uterine fractures are caused by external violence to the abdomen, or more frequently are the result of intra-uterine rachitis; they may be simple or compound. The simple intra-uterine fracture may unite before birth. Bryant¹ of London states that he saw a child born with a humerus bent at right angles, evidently from a repaired intra-uterine fracture. The compound fracture occurring *in utero* has resulted in wounds of the internal surfaces of the uterine, causing hemorrhage followed by abortion.

Fractures occurring during delivery are generally caused by too violent traction, or by forcible efforts to change the position of the child in version, or by the pressure of forceps. The kind of injury inflicted may be a separation of the epiphyses, or a simple fracture, or a compound fracture.

The bones of a healthy infant are much more elastic than at a later

¹ *Prac. of Surg.*

period of life, owing to the presence of unossified cartilage, and hence they bend under violence rather than break. When the force is so great that the bone yields, the fracture is likely to be partial, like a green stick, and transverse rather than oblique (Fig. 206). Green-stick

FIG. 206.



"Green-stick" Fracture of the Clavicle.

fracture, however, is more frequent in some bones than others, notably in the clavicle and in the bones of the forearm. In children we meet with separation at the epiphyseal junction. This is an accident rarely met with in the adult. In all lesions of the long bones in the vicinity of joints in children it is important to remember that the injury to the bone may be separation at the epiphyseal junction. The practical significance of this lesion is the liability to impairment of the future growth of the limb.

The diagnosis of fracture is often difficult, owing to the rapid swelling of the parts, which may create or efface deformity. It is usually safe, when a great amount of swelling exists, to place the limb in a comfortable position until the swelling subsides. But the delay in determining the nature of the injury should not exceed six days, as the union of fragments in healthy children is very rapid. If necessary to a positive diagnosis, an anæsthetic should be given.

If the bone is simply bent, and not completely separated, an effort should at once be made to forcibly straighten it under an anæsthetic, for repair in these cases is very prompt.

If, however, the fracture is complete, the ordinary dressings employed for similar fractures in adults should be applied.

CLUB-FOOT.

Talipes equinus (Fig. 207) is usually congenital. The treatment is operative and mechanical. The tendo Achillis and plantaris may alone require division, or, in addition, the plantar fascia must be cut, as when the arch of the foot is strongly contracted: the foot should usually be brought into position at once and retained by splints or the gypsum bandage.

Distortions of the feet may be due to spasmodic action of one class

of muscles, the antagonizing muscles acting normally, or to paralysis of one class, the opposing muscles being healthy. Careful examination of each case will determine whether spasm or paralysis is the cause; but, in general, congenital cases are caused by spasm, and non-congenital by paralysis. The general rule of treatment is to endeavor to

FIG. 207.

Talipes Equinus.

overcome by appliances those deformities which readily yield to manipulation and are caused by paralysis, and to divide contracted tendons in those which do not yield readily and are caused by spasm. The objects of treatment are the restoration of form and function, and the means to be employed are physiological, mechanical, and operative.

The scientific treatment of severe deformities can only be accomplished by a judicious combination of these three methods, and many of the failures are due to the want of this combination of principles too frequently considered antagonistic to each other.

Selecting talipes varus, the most frequent example of club-foot, the rules of treatment as regards the adoption of the several methods are as follows: (1) If no obstacle exists to the perfect restoration of form by gentle application of force, the defect may be remedied by the manipulations of the nurse, aided in more marked cases, if necessary, by simple mechanical appliances, as rubber, plaster, a boot with springs. (2) If the foot can be nearly but not quite restored to its natural form by the hand, the heel remaining somewhat elevated so as to limit or prevent flexion at the ankle-joint, tenotomy is justifiable, as it greatly hastens the cure. (3) In the more severe grades tenotomy is indispensably necessary: these cases are recognized by the following features: namely, the foot cannot be fully everted or brought to a straight line with the leg by manipulation, and in the attempt to effect this the inner malleolus does not become prominent; (4) the os calcis either cannot be depressed at all, or only to a slight degree, so that after the partial eversion of the foot little or no flexion at the ankle-joint can be obtained.

The following summary of principles of treatment of congenital club-foot deserves attention: 1. Whether the case promises favorably for mechanical treatment only, or needs, as the majority of cases do need, operative interference, commence the treatment as soon after birth as practicable. 2. Reduce the distortion from the state of a compound one (varus) to the simpler form (equinus) by first curing the inversion of the foot and the tendency to involution of the sole. 3. Avoid the

slightest undue pressure upon prominent points of the leg and foot by careful padding of the hollow parts and by using only gentle pressure with any bandage; avoid obstruction of the returning blood from the limb. 4. Remove splint and bandage daily, practice gentle movements of the foot in the desired direction, endeavor to prevent the part remaining for an instant unsupported and liable to fall back into the deformed position, until it is found that the foot, on removal of the bandage, retains a perfectly good position and flexibility. 5. Never permit the child to be placed on the feet or to walk until the form and movements are complete, whatever may be the age of the patient. The only apparatus necessary to carry out this treatment is a splint of tin or pasteboard so adapted to the external parts as to leave a space between the foot and splint when bandages are applied, or rubber plaster applied to the anterior part of the foot and passing up the external surface of the leg to which it is fastened.

Talipes calcaneus¹ (Fig. 208) is both a congenital and non-congenital affection. In congenital cases the deformity is of the simplest kind, the position of the foot being an exaggerated degree of flexion. In ordinary cases the treatment required is passive exercise and the use of a soft-padded splint applied in front of the leg and foot. In severe cases, with much contraction of the anterior muscles, the tendons of the *tibialis anticus*, *extensor proprius pollicis*, *extensor longus digitorum*, and *peroneus tertius* should be divided.

Non-congenital calcaneus is usually the result of infantile paralysis, and as a consequence tenotomy is seldom required; palliative treatment alone must be attempted by the application of a proper shoe.

Talipes varus¹ in its severe form has the following external characters (Fig. 209): namely, the anterior portion of the foot is turned inward, forming a right angle; the sole looks directly backward and the dorsum forward; the inner border looks directly upward, and the outer directly downward. The first stage of treatment consists in correcting the varus by turning the foot outward into a straight position or by bringing the sole squarely downward; the second stage consists in overcoming the elevation of the heel (*equinus*) if that exist. If the foot can be brought around nearly straight with comparative ease, the effort should be made by manipulation and bandaging to correct the deformity. This may be effected by many methods: (1) Apply a strip of adhesive plaster around the anterior part of the foot, commencing



¹ W. Adams.

on the dorsum and passing around the inside, then across the sole to the outside, and then, while the foot is turned strongly outward, up the outside of the leg to the knee; over this dressing apply a roller band-

FIG. 209.

Congenital Varus.

Club-Foot : three grades of severity.

age; repeat the dressing every second day (Fig. 210). Apply a splint adapted to the outside of the limb, with a foot-piece at an angle with the foot and, beginning at the upper part, bandage the leg and foot to the splint (Fig. 211); change the dressing every second day, giving to the foot strong traction externally.¹ (3) Give the patient chloroform,

FIG. 210.

Mode of Stretching Foot in Talipes
Varus by Strapping.

FIG. 211.



Varus Treated by Bandage.

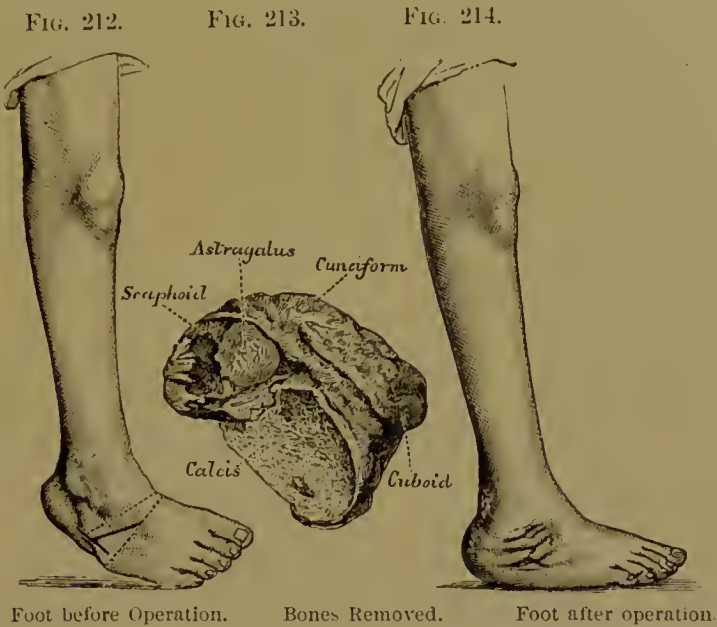
and, after forcing the foot outward fifteen minutes, apply a gypsum bandage; repeat the dressing weekly.² In cases which require tenotomy divide the *tibialis anticus* and *posticus*, and, if necessary, also the *tendo Achillis* and *flexor longus digitorum*; after the healing of the wounds apply the club-foot shoe.

The removal of a triangular mass from the tarsus³ on the outside has been successfully practised in severe cases⁴; the steps of the operation and the results will be understood by the illustrations (Figs. 212, 213, 214).

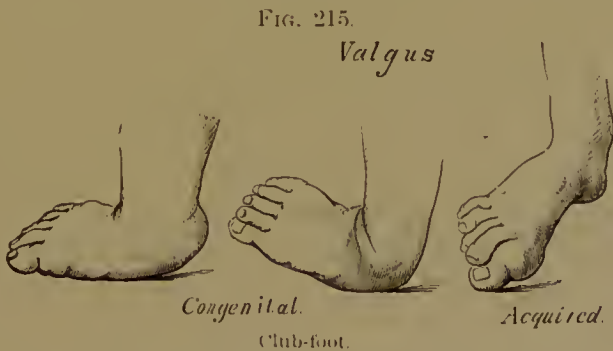
Talipes valgus (Fig. 215) is rarely congenital. Marked cases, without rigid muscular contraction, may be cured mechanically in a few

¹ W. J. Little.² A. Ogston.³ D. Colley.⁴ T. Bryant.

months without tenotomy, but severe cases demand a combination of operative, mechanical, and physiological means. The tendons requiring division in the slighter cases are the peronei and extensor longus, and the tendo Achillis, if involved; in very severe cases the tibialis anticus



and the extensor pollicis must also be divided. The mechanical treatment of slight cases in which the tendo Achillis is not divided is as follows: A convex pad of vulcanized india-rubber is placed inside of the boot in the normal situation of the arch of the foot which it is intended to support; it should extend halfway across the sole of the foot, and rise on the inner side so as to support the navicular bone; the



heel should be raised on the inner side about a quarter of an inch, so as to twist the foot inward and throw the weight on the outer side. In more severe cases it is necessary to add a steel support attached to the outer side of the boot and carried up to the calf of the leg, where it is

connected with a semicircular steel plate and a strap which encircles the leg ; a free joint should correspond with the ankle, and a leather strap attached to the inner side of the boot should pass across the ankle-joint and buckle outside the steel support. In the most severe cases, after tenotomy is performed, a shoe must be applied which effectually brings the foot by degrees into position.

CONGENITAL ANOMALIES OF THE EYE.

BY G. E. DE SCHWEINITZ, M. D.,

PHILADELPHIA.

It is the purpose of the present essay to give a brief description of some of the congenital malformations of the eye and its appendages, and of certain of the defects of this organ which result from intra-uterine disease. It would be manifestly impossible in a work of this description to even enumerate the entire list of congenital anomalies of the visual apparatus, nor would practical advantage be gained by an attempt to give an account of such irregularities in development as belong more exclusively to the domain of ophthalmology, and for whose study special training and special instruments of precision are necessary. For the consideration of these the student will naturally turn to the systematic writers upon ophthalmology and to the many elaborate monographs which are extant. For these reasons all descriptions of the congenital defects of the deeper structures of the eye—the choroid, retina, optic nerve; in short, all such anomalies as need for their detection ophthalmoscopic examination—have been omitted, and for obvious and similar reasons the treatment of these defects, where treatment is possible, except in incidental allusion, has not been included. There are, however, some congenital malformations of the eye, readily noted directly or soon after birth, which must be of interest alike to the obstetrician and to the ophthalmologist—malformations which may be studied without the aid of instruments, or at least with the help of ordinary oblique illumination.

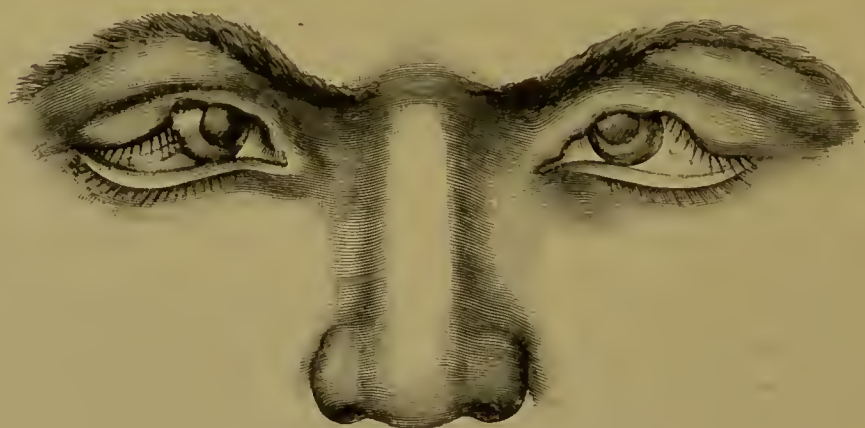
Failure of development in the eye, as Manz has pointed out, is among the most frequent of teratological phenomena, and it is not improbable that the relative great frequency of these defects depends upon the fact that in the eye even slight departures from the normal structure are easily observed.

CONGENITAL ANOMALIES OF THE EYELIDS.

COLOBOMA OF THE LIDS appears in the form of a fissure which may be confined to the upper lids, either one or both, but which has also been

noted in the lower lids, and even in both upper and lower lids. Dor of Lyons¹ has, with the aid of Jules Nicolin,² collected 47 cases of coloboma of the eyelids and 12 observations of oblique fissures of the face accompanied by palpebral coloboma. In 27 instances a single eyelid was involved, twice the two lids of the same eye, 16 times one lid of each eye, and once the deformity appeared on all four lids. In the majority of instances the defect is found in the upper lids. In an analysis made by Van Duyse,³ and further elaborated by additional cases by D'Oench,⁴ this position was noted 23 times in 33 cases, while 9 times the lower lid was affected.

FIG. 216.



Coloboma of the Eyelids (after Manz).

The cleft involves the entire thickness of the lid, with an intercalary portion between, which, for the most part, is composed of skin tightly pressed against the cornea or freely movable, or which is represented by a dermoid of the cornea. The situation of the coloboma when in the upper lid is in the middle; when in the lower lid the inclination is to the nasal side.

Coloboma of the eyelids may exist as a single malformation, but has more frequently been seen in conjunction with hare-lip (14 times in 47 cases), absence of the lachrymal puncta, dermoid tumors of the cornea, or, as in a case recorded by Schiess-Gemusens,⁵ where it was associated with coloboma of the iris and clefts in the pharynx, lip, and nose.

A variety of theories have been advanced to explain this anomaly. The older writers ascribed it to a primordial defect of organization; later, it was attributed to an arrest of development; still more recently, the hypothesis of Van Duyse, that its formation was due to

¹ *Revue générale d'Ophthalmologie*, December, 1888.

² *Du Colobome congénital des Paupières*, Lyons, 1888.

³ *Ann. d'Ocul.*, 1882.

⁴ *Archiv. of Ophthalmology*, vol. xv.

⁵ *Zeh. Klin. Monatsbl. f. Augenhk.*, vol. xxiv. p. 8.

the action of the amniotic strands, has received acceptance. Mention should be made also of Manz's theory of heterotopic tissue-formation, and that of Osio, who explained the occurrence upon the grounds of an intra-uterine inflammation. Nicolin and Dor,¹ with the belief that these explanations are insufficient, have studied coloboma of the eyelids in connection with the pathological anatomy of facial fissures, especially of the oblique fissures of the face, and have attributed to it a similar origin with them; that is, the result of an arrest of development at a time when the eyelids have as yet no existence, but when a failure of the joining of the two halves of the first branchial arch, together with the frontal prominence, determines an arrest of development which opposes itself later to the normal formation of the eyelids and gives rise to coloboma.

The deficiency may be remedied by freshening the edges of the gap and bringing together the opposed surfaces.

SYMBLEPHARON.—Symblepharon, as the name indicates, is a condition where there exists a cohesion between the eyelids and the ball. It may be complete or incomplete, although it is doubtful if any case, as Manz contends, of complete congenital symblepharon has been satisfactorily described, unless certain instances of cryptophthalmos, where a complete adherence between the skin of the lids and the eyeball has taken place, should be so accredited. In the case of incomplete symblepharon the teratological character may not always be safely assumed, as certain instances result from a fœtal inflammation. The eyelids are formed at the end of the third month as small cutaneous folds which come together in front of the globe, and are pressed tightly against the cornea of the growing eyeball: before the end of fœtal life this union is broken up, but if for any reason there is a failure in development of the ball or in the functioning of the eye-muscles, the separation does not take place and congenital symblepharon results.

ANKYLOBLEPHARON, or a union between the margins of the lids, appears in various forms in newborn children, and, like symblepharon, is seen in connection with other anomalies of development, appearing in its most total form in connection with anophthalmos—a condition presently to be described—or as partial cohesion, which, when merely the outer angles of the lids are involved, has received the name *blepharophimosis*. Sometimes instead of the adherence between the outer commissure, it is merely the middle portions of the lid-borders which are attached to one another, as, for example, in a case recorded by v. Hasner,² where the defect was found in the left eye of an otherwise healthy newborn girl, and was in the form of a thread, which, although not very thick, was still strong enough and so short that it hindered the entire opening of the fissure of the lids. As with symblepharon, many author-

¹ *Loc. cit.*

² *Prag. Zeitschr. f. Heilkunde*, 1883.

ities are inclined to attribute such appearances to the results of a foetal inflammation of the lid-borders, while others regard them as failures of development. In the beginning the lids are simply folds of ectoderm which pass gradually downward (the upper) and upward (the under). Their coalescence is afterward divided in the line of the later palpebral fissure. If this separation fails to take place, ankyloblepharon results. The treatment of such conditions should be conducted upon the same principles which govern the management of these deformities when they arise from the various pathological reasons which are their sources of origin in later life.

ABSENCE OF THE LIDS.—Under the general terms of *ablepharia totalis* and *partialis* defective development of the eyelids of different grades has been gathered together. The defect may be of such a nature that the lids themselves are wanting and the entire orbit is divested of any covering for the bulb: this produces the highest grade of *lagophthalmos*. In another variety the eyeball is entirely invisible, because the outer skin is drawn over it without the presence of the palpebral fissure—a condition to which Manz has given the name *cryptophthalmos*, and which is seen both in association with anophthalmos, or absence of the eyeball, and when the eyeball exists.

As Van Duyse¹ has correctly observed, the name *cryptophthalmos* should be preserved for those cases where the exterior integument passes in front of an eye more or less developed—*i. e.* where there is complete absence of the lids and palpebral fissure. If there is an absence of the eyeball, together with absence of the lids, the designation should be “*ablepharia totalis* and *anophthalmos*,” not “*cryptophthalmos* with *anophthalmos*,” which is, of course, a contradiction in terms. This condition, thus defined, is of extreme rarity. In such a case described by Van Duyse² a child of three weeks was found to be so deformed that the skin of the forehead passed in front of the eyes and joined with that upon the cheeks. Beneath this the eyeballs could be seen to move. In addition, there were other vices of conformation, most important among which were the imperfect development of the parietal bone and a meningo-encephalocele.

Fig. 217 is taken from the prototype which accompanies Van Duyse's paper. Such phenomena may be explained upon the theory of an arrest of development associated with failure in the evolution of the anterior structures of the eyeball. As in other deformities of the face, like the persistence of certain fissures, and in the eyelids, as in coloboma, the theory of amniotic attachments as factors in its formation has been thought of in connection with the condition just described.

In addition to a partial or complete absence of the eyelids, cases are on record in which they have been abnormally short. Thus Fuchs

¹ *Annales d'Oculistique*, Jan.-Feb., 1889.

² *Loc. cit.*

reports two such instances of abnormal shortness of the lids, so that the patients could close them only by the strongest pressure. Pflüger observed in a patient an abnormal length of the fissure of the lids, where complete closure was only possible by the greatest effort. Ectropium was not present.

FIG. 217.



Cryptophthalmos (after Van Duyse).

DISTICHIASIS, or the development of supplementary incurved rows of cilia, is often congenital, and is sometimes spoken of under the title of *distichiasis congenita*. In this condition the lashes of the outer edge of the lid are normally placed, but from the intermarginal part, close to the opening of the tarsal glands, a second row of cilia appears, which rubs against the eyeball. It may be seen as an unassociated congenital anomaly or in connection with other defects; for instance, in one case observed by Schweigger there was epicanthus and ptosis, and in another a cleft palate. The second row, or the increased number of the hair-follicles, is produced when the ordinary follicles are generated, but it is probable that in many instances this remains quiet, and the supernu-

merary row of lashes does not appear until about the age of puberty, when it springs forth under the same impulse which the growth of hair in other regions receives at this age. Complete absence of the eyelashes has been recorded as an unusual anomaly.

CONGENITAL PTOSIS.—Congenital ptosis, as usually seen, consists in a drooping of the upper lid over the eyeball, so that its lower margin covers the upper border of the pupil or its middle, or even sinks lower still. Under any circumstances it cannot be elevated above the points just mentioned. It may be either unilateral or bilateral, usually the former. It has been observed within the first few days of life by Horner, and is occasionally present in succeeding generations of the same family, this author having seen it in three successive generations. It is not an uncommon defect, and, like other malformations, is frequently seen in association with vices of conformation in other organs of the body, and especially with defective movements of the external eye-muscles and with the condition known as epicanthus. Horner records a case in which there was limitation in the movement of the superior rectus, and I have myself seen an instance where the ptosis had been present since the earliest days of babyhood, and was associated with a divergent squint from paresis of the internal rectus. Ptosis has usually been divided by systematic writers into two varieties: those in which there was a positive hypertrophy of the connective tissue, so that the upper lip overhung the lower because of this redundancy of the lid-tissue; second, those in which the drooping was due to absence or imperfect development of the levator palpebrarum, or to a paralysis of this muscle. Its presence, also, has been attributed to the pressure of the forceps during birth, but Horner¹ very properly is not willing to concede this theory, inasmuch as he has seen this affection in the first days of life, and, moreover, without any mark of the instrument upon the face of the child, and has followed it through several generations of one family. Furthermore, the frequent association of this defect with epicanthus, ankyloblepharon, and other abnormalities militates against this idea.

EPICANTHUS.—Epicanthus is the name which v. Ammon gave to a somewhat rare affection in which, owing to an excessive development upon the bridge of the nose, a fold of skin passes from the inner end of the brow to the side of the nose and covers the internal canthus. The concave free border, which stretches outward, hides the commissure of the lids, the caruncle, the lachrymal puncta, and, in aggravated instances, a considerable portion of the area of the lids. Epicanthus is generally bilateral, and is usually associated with congenital ptosis.

As Horner² has pointed out, an examination of this region in newborn children, and a comparison of it with the bridge of the nose and the folds of the lid, might readily lead to the belief that

¹ Gerhardt's *Handb. d. Kinderkrankheiten*.

² *Loc. cit.*

a low grade of epicanthus is very common. This appearance, however, disappears in the later development of the face and nose. The fact that the free border of the abnormal fold of skin may nearly cover the sclera, between the margins of the cornea and the inner commissure, gives rise to an appearance as if a convergent strabismus was present; and v. Graefe expressed the opinion that epicanthus depended essentially not so much upon the development of an abnormal fold of

FIG. 218.



Epicanthus (after v. Ammon).

skin as upon an insufficiency of some of the twigs of the oculo-motor nerve, especially those which pass to the levator palpebrarum and the superior rectus. Moreover, Hirschberg¹ has demonstrated a connection between epicanthus and ophthalmoplegia, in which the defect appeared to be due to a congenital aplasia of the gray nuclei below the aqueduct of Sylvius: the fold of the skin extending from the upper to the lower lid, which is generally regarded as characteristic of epicanthus, was absent. It is not improbable, however, according to Manz,² that all of these and similar anomalies have a common origin in the development of the bones of the face which are concerned in this region. This abnormality may appear in several members of the same family; thus, Alvarado observed three cases of epicanthus in the father, son, and daughter, in which the superfluous tissue appeared like a tumor. Some authors³ have described under the name of *epicanthus externus* a somewhat analogous affection in which the fold of skin was observed to

¹ *Neurolog. Centralbl.*, 1885, No. 13.

² Graefe und Saemisch: *Handbuch der gesamten Augenheilkunde*.

³ Quoted by Manz, *loc. cit.*

cross the outer angle of the eye. If a child born with epicanthus does not lose this appearance in the course of the development of the bones of the nose and the face, an attempt may be made to remedy the deformity by excising a portion of the redundant integument from the bridge of the nose and stitching together the opposed surfaces.

ANOMALIES OF THE LACHRYMAL APPARATUS.

The anomalies of the lachrymal apparatus which appear most frequently are those of the canaliculi and the puncta. These may be double, as in the cases recorded by Mooren, Galezowski, Horner, and other observers, while a much rarer congenital anomaly is the absence of the tear-passages and even of the tear-sac. V. Reuss has described the case of a boy in whom all four of the lachrymal points were absent, while the papillæ were present, and the canals were represented in the lower lids by furrows; in the upper lids they were wanting. Bader also describes complete patulency of the canaliculus.

CONGENITAL FISTULAS of the lachrymal sac have not been infrequently observed, appearing in the form of a fine opening on its anterior wall, from which a drop of fluid may be seen to ooze. These may be single, or, as Agnew¹ and others have recorded, double. Doubt has sometimes been cast upon the question whether a fistula of the tear-sac can occur as a congenital anomaly. It is, however, perfectly reasonable to assume that this defect may result from an imperfect closure of the eye-nasal groove. It is well to remember in this connection, as a matter entirely apart from congenital disease, that suppuration of the lachrymal sac, on one or both sides, sometimes takes place in newborn infants without assignable cause, and this may open on the face, leaving a fistulous orifice. Kipp found during a two years' service 3.6 per cent. of cases of lachrymal disease, and 10 per cent. of these were under one year; the disease was often seen shortly after birth.

Tumors are not infrequently found congenitally in connection with the lachrymal gland. The form in which these new growths usually appear is that of an hypertrophy of the gland, or an adenoma, or more rarely, as a species of cystic degeneration.

ANOMALIES OF THE CONJUNCTIVA.

Among the congenital anomalous conditions of the conjunctiva mention need only be made of DERMOID TUMORS, a more detailed description of which will presently be given when discussing the defects of the cornea. Besides these dermoid growths other congenital

¹ "A Case of Double Congenital Lachrymal Fistula," *Transactions American Ophth. Soc.*, 1874.

changes and thickenings of this membrane have been described, as, for instance, a malformation resembling external pterygium, a case of which has been recorded by Strawbridge,¹ where a growth of thickened conjunctiva sprang from the outer commissure and covered the corneæ to fully one half their surface. The case came under observation when the child was six weeks old.

Of most interest to obstetricians are the affections of this membrane grouped under the name *ophthalmia neonatorum*, the origins of which are to be sought for, except in a few rare instances, during or immediately after parturition, and which are fully dealt with in another section of this volume.

ANOMALIES OF THE CORNEA.

MICROPHTHALMOS, or that condition where the entire eye remains in a more or less rudimentary condition, and where the cornea is too small in all its diameters, is observed both as a unilateral and a bilateral affection. The imperfect development of the eye may appear in the form of an atrophy of the various constituents of the globe, which still remain in due proportion, as in an example of symmetrical microphthalmos described by F. R. Cross,² or as in a case detailed by Carl Hess,³ where all parts were histologically perfect, except a cataractous lens, but of diminutive size. Such cases of pure microphthalmos are, according to Manz, among the greatest of rarities, and for which we have no adequate explanation: usually one or other of the component portions of the globe may be wanting, as, for instance, the lens, or coloboma of the iris, choroid, or retina, or cystic change in the interior of the bulb may be found. Examination of the orbit in a case of microphthalmos may reveal either the presence of a bulbus externally of normal shape, but of diminutive size, or the space within may be wellnigh empty except for a small white elevation which moves in co-ordination with the other eye. So devoid of contents may the orbit appear that the case may be looked upon as one of anophthalmos, or absence of the eye. Indeed, Michel mentions an instance of such a nature where only cartilage existed behind the apex of the conjunctival sac, which, however, as Manz has suggested, might be looked upon as the rudiment of an eyeball.

Many views have been expressed in regard to the etiology of microphthalmos. Kundrat believed it was due to a retarded growth of the cerebellum; Arlt attributed it to delayed or incomplete closure of the fetal ocular cleft; Wedl and Boeh incline to the doctrine that a fetal

¹ *Transactions of the American Ophth. Soc.*

² *British Medical Journal*, ii. p. 1153, 1885.

³ *V. Graefe's Archiv für Ophthalmologie*, 1888, vol. xxxiv.

illness *in orbita* and its structures may cause a retardation of the growth of the globe. Dentschmann's theory that microphthalmos was caused by intra-uterine inflammation, and was, in fact, a sclero-chorio-retinitis, has received a wide acceptance among many observers. In order to fully appreciate the genesis of microphthalmos, examination must first be made how far the normal development has progressed in the bulbus under consideration, and according to the findings a determination at what part of the evolution of the eyeball the arrest of development first began may be reached.¹

Here, as with the other congenital defects of the eye, the question of heredity deserves mention. Hereditary disease may be present at birth, and, as Fuchs² declares, it usually appears in a similar or analogous form in the parent and the offspring. In support of this may be mentioned the instance in which a man blinded by ophthalmia neonatorum begot two children, both of whom possessed microphthalmic eyes. In the second instance the right eye of the father was destroyed in early childhood by an irido-cyclitis, and the corresponding eye of his son was microphthalmic. These facts deserve more consideration than that which might be accorded to a mere coincidence, inasmuch as Dentschmann has obtained similar results in experiments on the lower animals.

CONGENITAL HYDROPTHALMOS, or BUPHTHALMOS, or CORNEA GLOBOSA, as the affection is variously designated, is a disease of early childhood, the incipient stages of which are believed to be intra-uterine. The characteristic appearances consist in a great enlargement of the cornea in all its diameters, increased depth of the anterior chamber, a tremulous state of the iris, and a marked thinning of the sclerotic coat. In the later stages of the affection the cornea not infrequently becomes hazy, the *keratoglobus turbidus* of some writers. The precise cause of this condition has not been accurately determined. It has been ascribed to an intra-uterine irido-keratitis with increased intraocular pressure; in other words, a form of congenital glaucoma. M. Durr,³ in an anatomical examination of several megalophthalmic eyes, found that the larger oblique muscles presented a greater obliquity than is ordinarily the case, and were rolled round the globe so tightly that an impression was left on the surface of the sclerotic, the result of which was a noticeable compression of the emergent veins. The prognosis, as far as sight is concerned, is distinctly unfavorable; the affection, in spite of operative interference and the use of eserine, often progresses to blindness.

¹ Those interested to pursue this subject further should consult the elaborate papers of Dr. Carl Hess of Mainz and Dr. Herman Becker in v. Graefe's *Archiv f. Ophthalmologie*, vol. xxxiv., 1888.

² *Causes and Prevention of Blindness*, 1885; *Ophthalmic Review*, iv., 1885.

³ *Ann. d'Oculistique*, July and August, 1888.

SCLEROPHTHALMIA is the name which is sometimes applied to that condition when the opacity of the sclerotic, instead of stopping at the margin of the cornea, encroaches upon this membrane in such a manner that it may be only the central portion remains transparent. In other particulars such an eye may be of normal composition. When present this indicates an imperfect differentiation of the cornea and sclera at an early period of foetal life, the cornea, up to a certain time of intra-uterine existence, being as opaque as the sclerotic. In a certain number of cases of irideremia, or absence of the iris, this sclerosis of the cornea is present in the form of an annular opacity involving its periphery. To this appearance Stellwag gave the name *foetal ring*.

CONGENITAL OPACITIES OF THE CORNEA.—The normal transparency of the cornea may be found at birth to be marred by the presence of milky spots, which may clear up in later life, or by the existence of denser opacities. Finally, congenital staphyloma of the cornea is described. The various forms of corneal opacity which appear as congenital affections resemble like changes occurring after birth as the result of corneal ulceration. In a case which I recently observed in the maternity wards of the Philadelphia Hospital, an oval, dense white, slightly prominent leucoma occupied the lower and outer quadrant of the left cornea. In all other respects the child was normal; the mother was a healthy Irish woman without eye affection and with no infectious vaginal discharge. In like manner, the possibility that that type of keratitis, which is described as interstitial or parenchymatous keratitis, may exceptionally arise *in utero* has been disensed. For example, Dr. R. L. Randolph¹ has reported a congenital clouding of the cornea affecting two sisters, which was looked upon as a congenital form of interstitial keratitis, not differing from the ordinary—or, what he called in contradistinction, the postnatal—form of the disease.

CONGENITAL STAPHYLOMA of the cornea has not been much mentioned by systematic writers. When present, it appears in the form of a true staphyloma; the cornea converted almost in its entire expansion into cicatricial tissue rich in vessels, to which the iris may be attached in its entire circumference, and the whole mass be in high degree prominent and bulging forward. In these cases the anomaly depends not so much upon a malformation or arrest of development as upon a foetal inflammation of the eye. This, according to Oskar Pincus,² takes place in the second half of foetal life, because all portions of the eye are fully developed. The possibility of a gonorrhoeal infection of such cases may not be entirely disregarded, inasmuch as Fuchs has observed perforation of the cornea at birth due to a congenital blenor-

¹ *Am. Journ. Med. Sci.*, December, 1888.

² "Beitrag zur Lehre vom Staphyloma Corneae congenitum," *Inaug. Dissert.*, Königsberg, 1887.

rhœa. Of some etiological significance in these and similar congenital anomalies of the cornea is the question of heredity. Arlt¹ refers especially to leucomatous thickenings, seen not only in several members of the same family, but also in the children of one of the patients thus afflicted. These and similar anomalies may remain stationary through one generation, passing over single members of a family or even an entire generation. In this connection, the researches of Brown-Séquard, who experimentally produced corneal cloudings in guinea-pigs to the eighth generation, are significant. The less pronounced instances of corneal change, like staphyloma, are probably most frequently the result of intra-uterine inflammation, but are also ascribed to an arrested development.

DERMOID TUMORS of the cornea are seen in the form of hemispherical masses situated usually at the corneo-scleral junction, yellowish-white or slightly pinkish in color, the apex somewhat pitted and depressed, and capped with a number of short hairs. These congenital growths are found at birth, and may slowly progress in size with the growth of the child. A single eye

may be the site of the tumor, but instances are on record in which they have been bilateral. The hairs which grow from the apex of the swelling are usually short, sometimes so light-colored and fine as not to be readily perceptible, and again, coarse and dark, and as in Wardrop's case, long enough to protrude through the fissure of the lids and hang down upon the cheeks. The examination of these growths

discloses their composition to be similar to that of the skin. They contain hair-follicles, hair, connective tissue, and fat. They may exist alone or in association with other congenital anomalies, especially of the eyelids. The solid dermoid tumors of the eyeball are of much rarer occurrence than the ordinary cystic dermoids of the eyebrow. Picqué² has collected 94 cases of dermoid tumors of the cornea and conjunctiva, 85 of which were observed in human eyes. Included among them are the excrescences of these membranes, the *brides épibulaires* of French writers, which stand in close relationship to coloboma of the eyelids, and to which reference has already been made. These dermoids have been ascribed by Van Duyse to the remains of amniotic adhesions, but Picqué thinks rather that they should be looked upon as resulting from the coalescence of the eyelids in such

FIG. 219.



Dermoid Tumor of the Corneo-scleral Border (from a patient in the Philadelphia Hospital).

¹ *Krankheiten des Auges.*

² *Anomalies de Développement et Maladies congénitales du Globe de l'Œil.*

a way that at the moment of separation one lid attracts to itself a portion of the other. This view is based upon the fact that the structure of the growths very often agrees with that of the lid-border. The treatment consists in dissecting away the tumor, which is entirely benign in its nature.

Sometimes a yellowish protrusion exists between the lid and the globe, usually at the outer side of the orbit, which is a *congenital fibrofatty tumor*.

CONGENITAL ANOMALIES OF THE IRIS.

HETEROPHTHALMOS, or the condition in which the color of one iris is different from that of the other, is probably a peculiarity, in most instances, without pathological significance. This chromatic asymmetry of the iris may appear in the form of differences in color, in shade, or in tone; most unusual is a positive dissimilarity in color. It is necessary to differentiate between discolorations produced by local causes like iritis and those which are of congenital origin. In later life this appearance is, in the opinion of some observers, significant of the neurotic constitution.¹ In an examination of 50 cases of chorea of childhood which I made the symptom was present in 50 per cent. of them.²

CORECTOPIA is a term applied to an eccentric position of the pupil, not to be confounded with the cases of true coloboma of the iris presently to be described. The grade of corectopia may vary from a slight increase of the normal eccentric position of the pupil below, and to the inner side, up to those cases in which the whole pupil is displaced out of the centre of the iris toward the border of the cornea. The latter variety is a very unusual phenomenon. *Ectopia*, or this complete shifting of the normal position of the pupil, may naturally have various causes, and is ascribed either to an essential malformation or to the result of a foetal iritis. Both eyes may be affected symmetrically, and several members of the same family may present this defect.

POLYCORIA, or a multiplicity of pupils, is a rare anomaly. The abnormal pupil or pupils may be situated in the immediate neighborhood of the normal pupil, separated from one another by a narrow band of iris-tissue, or the increased number of pupils may be the result of crossing strands of persisting pupillary membrane.

An opening which exists at the ciliary margin of the iris has been described, and is probably due to a congenital irido-dialysis.

¹ Féré: *Le Progrès médical*, September 25, 1885.

² "An Examination of Fifty Cases of Chorea in Childhood," *New York Medical Journal*, June 23, 1888.

PERSISTENT PUPILLARY MEMBRANE is an interesting anomaly of not very infrequent occurrence, and results from an incomplete resolution of the membrane which covers the anterior surface of the lens during foetal life. In which month this membrane, in the human foetus, makes its appearance has not been definitely ascertained. Authors have variously supposed this to be from the eighth week to the fourth month. In like manner, difference of opinion exists as to what time the membrane disappears. It has usually been supposed to subside in the seventh month, others have described its appearance as late as the end of intra-uterine life, and still others even as late as the first month after birth. The retrograde metamorphosis of the membrane usually consists in the contraction of its vessels, which spread themselves out in the form of arcades, after which the connective-tissue stratum is destroyed. If, however, some remnants remain behind, a pathological picture is the result. From the embryological standpoint, as W. J. Collins¹ observes, it is more proper to regard the pupillary membrane as merely a specialized portion of the capsulo-pupillary covering. Those cases to which the name of pupillary membrane is alone accurately applicable are where threads attached to the iris pass diametrically, or cordwise, across the pupil. Several varieties of the persistence of the pupillary or capsulo-pupillary membrane exist. Usually the fibres proceed from the anterior surface of the iris across the pupil, either singly or in groups of a dozen or more strands. Sometimes the fibres remain separated; sometimes they grow together in front of the anterior capsule, and sometimes they unite in the form of a variously colored plaque adherent to the capsule of the lens. In one instance the remains took on the form of a central white curtain which was suspended by fine threads from the anterior surface of the iris.

Persistent pupillary membrane is more frequently seen in one than in both eyes. The question of heredity has been raised in relation to this disorder, but has by no means been satisfactorily determined.

Capsulo-pupillary tags are not infrequently mistaken for the synechia due to iritis. Indeed, the association of the two has been observed. No difficulty should, however, arise because the normal action of the pupil is not impeded by the presence of these vestigial anomalies. The appearance is often not detected until some other disorder calls for an ophthalmoscopic examination, because vision is not seriously or at all impaired. Oblique illumination will, however, readily demonstrate the remains of the pupillary membrane if present, and is, indeed, the best method in which to study this phenomenon.

COLOBOMA OF THE IRIS is a fissure of this membrane which, in a general way, resembles an artificial pupil made by the operation of

¹ *The Royal London Ophthalmic Hospital Reports*, vol. xii., July, 1888.

iridectomy. Its occurrence is quite frequent ; in fact, it is probably the most usual of the congenital defects of the eye.¹ Fichte, quoted by Manz,² among 78 cases of coloboma of the iris found 44 among males and 34 among females. Both eyes are more frequently affected than a single eye ; when the defect is unilateral it is the left side, on which the anomaly is usually found. The situation of the fissure is almost invariably directed downward and inward, although Dr. Samuel Theobald³ reports a case of double congenital irideremia in a child whose mother had congenital coloboma of each iris, and in one eye the coloboma was directed *upward*—a practically unique observation. The coloboma may extend across the whole iris (complete coloboma) or stop at a certain distance from the ciliary margin (incomplete coloboma). In addition the so-called *pseudo-coloboma* is described, which may perhaps be looked upon as a form of heterochromia of the iris, or, according to Mittstädt, as the last remains of the ocular fissure which is tending toward closure, and which appears as a small stripe, somewhat granular, and differentiated from the rest of the iris by its brighter color. In “bridge coloboma” the borders of the

FIG. 220.



Incomplete Coloboma of Iris (after Meyer).

cleft are united by a narrow, pigmented or colorless, transverse band of fibres. Coloboma of the iris is frequently associated with similar defects in the choroid, and also with microphthalmos, congenital cataract, and fissures of the eyelids, lip, and palate. Its most probable cause is an arrest of development, the result of incomplete closure of the choroidal fissure, or the fissure of the secondary optic vesicle ; hence its situation in the lower and inner quadrant of the iris. Much evidence has been brought to show an hereditary tendency in this defect, and several members of the same family are not infrequently affected. Thus in Streatfield's case⁴ two brothers were afflicted with iris coloboma, and one transmitted it to his son and grandsons, seven in all ; and in a rare family history of congenital coloboma of the iris De Beek⁵ found that seven members had been affected, the anomaly occurring in two generations and passing down two separate branches.

¹ Mooren (*Nagel's Jahresbericht*, 1883, p. 259), however, found coloboma of the eye (iris and choroid) in only 23 instances among more than 100,000 patients.

² *Loc. cit.*

³ *American Ophthalmological Society*, 1888.

⁴ *Royal London Ophthalmic Hospital Reports*, vol. i. p. 153.

⁵ *Archives of Ophthalmology*, 1886, vol. xv. p. 8.

IRIDEREMIA, or congenital absence of the iris, is found both in a partial and a complete form. When the loss is total, a casual observation of the eye makes it appear dark, while closer examination reveals the pupillary field to be really somewhat gray in color, as it is under full dilatation after the use of a mydriatic. Indeed, the appearance resembles in a general way an eye under the influence of complete mydriasis. Some observers have noted a reddish tinge in such eyes. Total congenital irideremia is almost invariably bilateral, only a few cases being on record in which one eye alone was affected. One such case is recorded by Harlan.¹ It is frequently associated with other anomalies of the globe—partial or complete cataract, dislocation of the lens, nystagmus, strabismus, and departures from the normal curvature of the cornea, or with annular opacities in its periphery, the fetal ring of Stellwag's nomenclature. Congenital absence of the iris, in the majority of instances, shows a marked hereditary tendency. In a collection of 30 cases by A. Laurentjeff,² 19 showed this evidence of heredity, while in De Beck's list of congenital colobomas of the iris and cases of irideremia 26 examples furnished evidence of hereditary transmission, 10 of which were direct from the father. Arrested development and intra-uterine disease have been ascribed as causes of irideremia, while Manz has taught that the defect was due to a too late separation of the lens from the anterior wall of the eye, whereby the interposition of the iris between the two was prevented.

Further defects of the iris which may be mentioned are the results of *intra-uterine iritis*, to which reference has already been made, and *intra-uterine atrophy of the iris*, as recorded by Jessop,³ where the anterior epithelial layer was wanting, although the other structures were perfect, and the so-called *congenital ectropium of the uvea*, where a round exerescence is found projecting from the margin of the pupil, bending around to the anterior border. A similar formation is proper to the eye of the horse, and is frequently seen in the cow. Some authorities have looked upon this as a papilloma of the iris, but, as Aneke⁴ points out, this is not accurate, for the exerescence is not a neoplasm, but a congenital ectropium of the uvea. Very occasionally congenital *cysts of the iris* have been described; for instance, the case of Noyes,⁵ and *navi*, which appear as small black patches, and have been called "simple melanoma."

ANOMALIES OF THE CRYSTALLINE LENS.

CONGENITAL CATARACT, both in a partial and a complete form, is a somewhat rare affection, where examination of the eyes reveals

¹ *Trans. College of Physicians, Philada.*

² *Abstract Ophthalmic Review*, 1886, p. 10.

³ *Ophthalmic Review*, vol. vi. p. 22.

⁴ *Cent. f. Prakt. Augenh.*, Oct., 1885, p. 311.

⁵ *Transactions of the American Ophthalmological Society*, 1880.

behind the pupil the white opaque lens, the study of which is greatly facilitated by the instillation of a drop of atropine in order to produce mydriasis. The relative frequency of the affection is attested by the following figures quoted from Lucien Picqué.¹ Galezowski found 7 cases among a total of 551 cataracts during one year. The clinic of Zurich furnished 23 congenital cataracts among a total of 360; and in the tables of De Wecker, among 40,000 cases of various forms of eye disease, 36 total congenital cataracts are enumerated.

A number of theories have been advanced in order to elucidate the etiology of this affection—namely, those which attribute its existence to an inflammation developed during the course of intra-uterine life—an idea which has received some support from the frequent coexistence of coloboma, microphthalmos, and hydrophthalmos—and to the presence of changes in the choroid which have disturbed the nutrition of the eye. Arrest of development and the influence of heredity have received their share in the causation of this affection, in the last particular with much evidence in its favor. Picqué² enumerates many instances where members of the same family were attacked; as, for instance, that of Arago, where six persons of one family were subjects of cataract; in one of the branches the mother and three daughters, in the other the mother, grandmother, and granddaughter. In a remarkable instance of heredity in a form of cataract developed in early life, G. A. Berry³ found, out of 55 individuals belonging to five generations, 20 had cataract—8 males and 12 females. As Berry emphasizes, however, this was a form of cataract developed in early life, and not true congenital cataract, in which variety his experience failed to show the evidence of heredity. Two varieties of congenital cataract which may be mentioned, in contradistinction from the total opacity of the lens just described, are those forms which have received the names of *zonular cataract* and *pyramidal cataract*, a detailed description of which would not be in place in the present essay. Congenital cataracts are frequently and successfully treated by operative interference, but occasionally even after the most perfect operation and the absorption of the opaque lens there is a failure to restore vision, owing to the imperfect development or diseased condition of the deeper structures in the eye.

Partial or complete *luxation of the crystalline lens* occurs as a congenital defect, and its entire absence has been described.

ANOPHTHALMOS, or a complete absence of the eyes, is an affection which, like the other anomalies, is more frequently observed to be double than one-sided. E. T. Collins⁴ has collected 12 instances of

¹ *Anomalies de Développement et Maladies congénitales du Globe de l'Œil*, Paris, 1886.

² *Loc. cit.*

³ *Ophthalmic Review*, vol. vii. p. 1, 1888.

⁴ *Royal London Ophthalmic Hospital Reports*, vol. ii., 1886 to 1887, p. 429.

unilateral anophthalmos, to which Young¹ has added 11 more. A child born without eyes may be healthy and well developed in other respects, or may be the subject of additional congenital deformities. The palpebral apertures are small, the lids usually deficient in size, sunken, and upon their separation the empty orbit without trace of the globe is revealed.

In 23 out of 30 cases collected by Collins² no other deformities were present. In 4 there were no notes as to other deformities, while in the

FIG. 221.



Anophthalmos (after E. T. Collins).

remaining 4 left-sided hare-lip, double hare-lip, supernumerary fingers, palatine fissure, deformity of the skull, and, in one of the unilateral cases, talipes calcaneum of the right foot, existed. Diverse causes have been invoked to explain the existence of anophthalmos. That which appears to be the most reasonable upon the face of it is, as Collins in his analysis of post-mortems in such cases points out, that no primary optic vesicle has budded out from the anterior primary encephalic vesicle, or, having budded out, has failed to form a secondary optic vesicle—an explanation, however, which does not fit in all cases, inasmuch as we have the instances of cryptophthalmos and anophthalmos associated with the formation of cysts in the lower lid, as recorded by

¹ *The Medical News*, June 9, 1889.

² *Loc. cit.*

Snell and v. Reuss, where the opening of the cyst disclosed a misplaced rudimentary eyeball. Kroll, quoted by Picqué, has seen bilateral anophthalmos in a newborn child, with ectropium and a purulent secretion of the conjunctiva, which the author explained as the result of a total disorganization of the globe following an intra-uterine bleb-orrhœa of the conjunctiva. The question as to the primary cause of this abnormality has naturally led to a search for hereditary influence and consanguinity of the parents, but without definite results in the large majority of cases. In 12 of the cases of Collins' collection a maternal impression or fright is mentioned as having occurred during pregnancy; for example, fright during the first month; a child in a fit with its eyes rolled up on the fifteenth day; visiting a blind asylum daily during the whole of pregnancy; seeing a man with one eye during the second month. But if the view taken by this author is correct, that the abnormality is caused by the non-formation of either the primary or secondary optic vesicle, only such impressions as occurred in the very earliest stages of pregnancy could be operative, since commencement of the optic vesicle has been seen in the embryo chick on the fourth day.

CONGENITAL STRABISMUS.—Squint has frequently been stated to be a congenital malformation, but, as Manz insists, in the majority of instances this really develops some time after the birth. The statement, moreover, that in newborn children convergent strabismus is found, as a rule, is not accurate; it is only correct in so far that the axes of the eyes, which in the early foetal months diverge, later become more and more parallel, so that it appears as if the cornea, owing to the roomy condition of the inner commissure of the eye, was not situated directly in the middle of the palpebral fissure.

Of the anomalies of the external eye-muscles which have been recorded, the most frequent are those due to their abnormal insertion, and even to their entire absence. So, also, we have the instances of congenital paralysis of the eye-muscles and lateral deviations of the eyes. Thus Swanzy¹ observed a case where both eyes turned to the right, and which, when they passed the middle line, developed marked nystagmus. In this case labor had been natural; the eyes were opened on the fourth day, when the nystagmus was first noticed. The cause was supposed to be due to an intra-uterine lesion in the pons implicating the nucleus of the sixth and third pairs. In a similar case observed by Lawford in an adult, examination had revealed absence of the right internal rectus and poor development of the left external rectus. Imperfect development of the eye-muscles, associated with disturbances in the movements of the eye, have been observed in several members of the same family, especially by Heuck and Lawford. Finally, those

¹ *Ophthalmic Review*, vol. vii. p. 358.

cases of squint which have resulted from the injury of forceps during instrumental labor deserve mention.

CONGENITAL TUMORS OF THE ORBIT have been found in a variety of forms, among which the most frequent are cysts, especially dermoid cysts. These may be situated between the bulb and the lids or behind the globe, and be accompanied by marked exophthalmos.

CONGENITAL PIGMENTATION OF THE EYES has already been referred to when speaking of chromatic asymmetry of the iris, and to which may be added the appearances seen in the condition which has been called *melanosis oculi*, where pigment-spots appear upon the lids, the conjunctiva, and the sclerotic.

ALBINISM, or a congenital want of pigment in the choroid and iris, is a striking deformity which is met with both in a complete and incomplete form. The iris has a pink or pink-and-yellow appearance due to the reflection of light from its own blood-vessels and from those of the choroid, which, in the most pronounced forms of the defect, can be seen with the ophthalmoscope down to their finer branches. The anomaly is most marked in early childhood, is almost invariably associated with lack of pigmentation in the hair, and is accompanied by nystagmus, a certain amount of amblyopia, and the development of a high grade of refraction defect. In many instances albinism has been observed in several members of the same family, and seems to be hereditary.

The description of the malformations which have just been given include only a brief account of such as may be readily studied without the aid of special instruments of precision, and, such, moreover, as may be seen soon after birth or at least within the first few months of life. Discussion of mooted questions and all detailed description of the anomalies recorded have been advisedly omitted, as also has all reference to such gross malformations as, for example, the cyclops monster and like deformities.

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Chapter II.—Symptoms and Clinical History.—Analysis of Individual Symptoms.

Chapter III.—Changes in the Fundus Oculi.—Double Optic Neuritis and Optic Atrophy.

Chapter IV.—Motor Derangements.—Paralysis.—Spasm.—Tremor.—Contracture.

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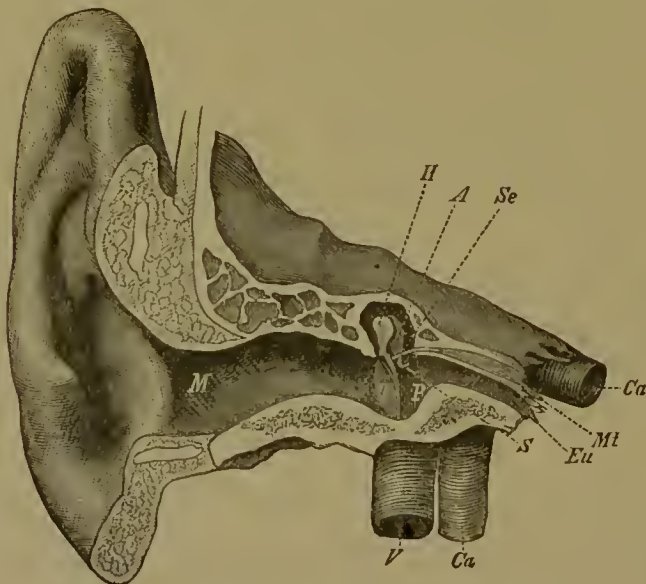
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